Rubber Journal and International Plastics

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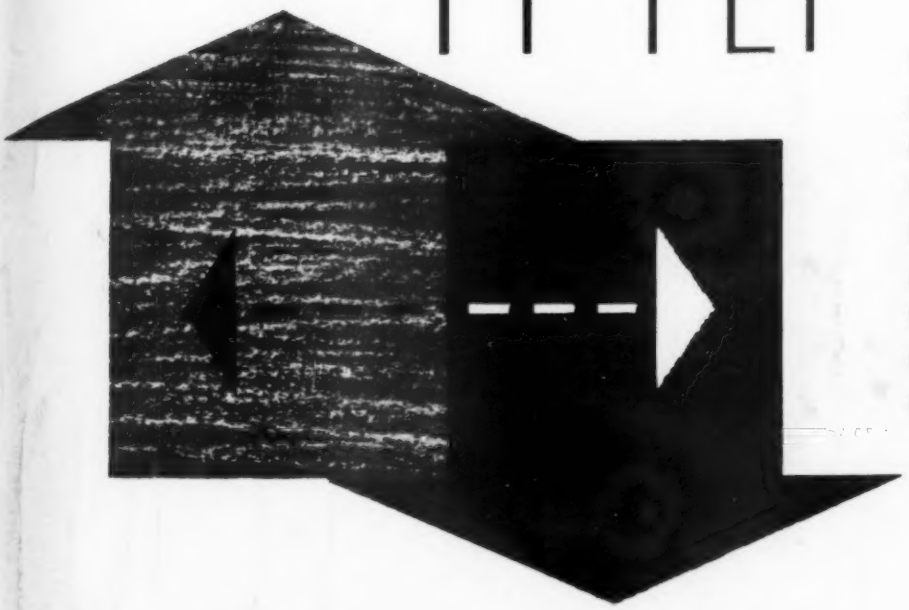

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IN ITS 75th YEAR

April 18 1959

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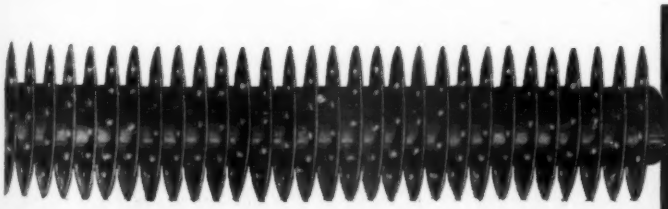

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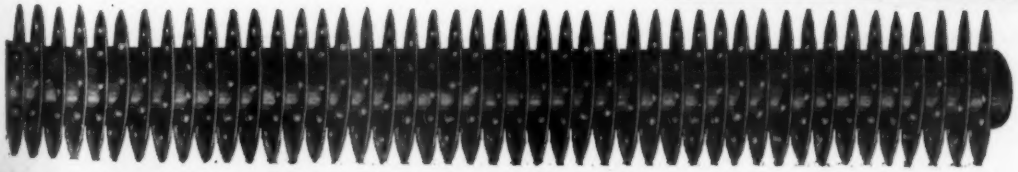

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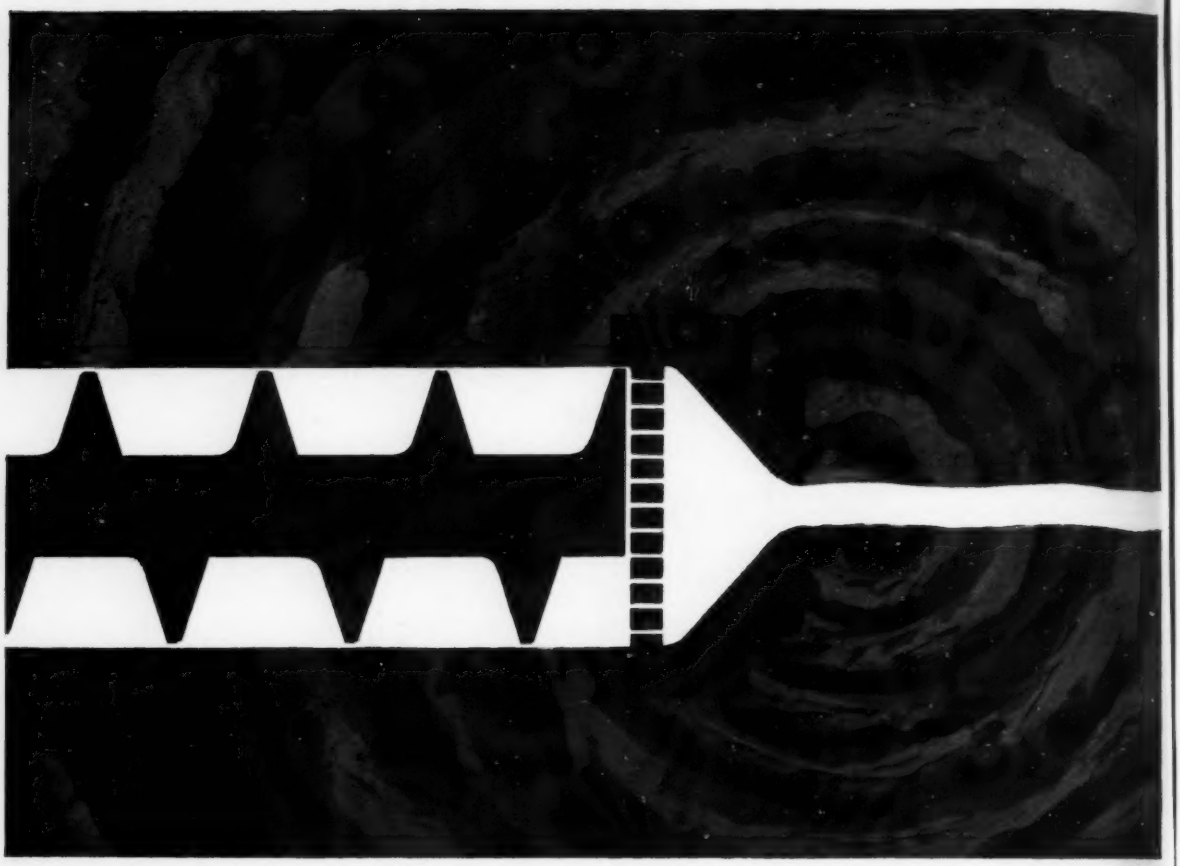

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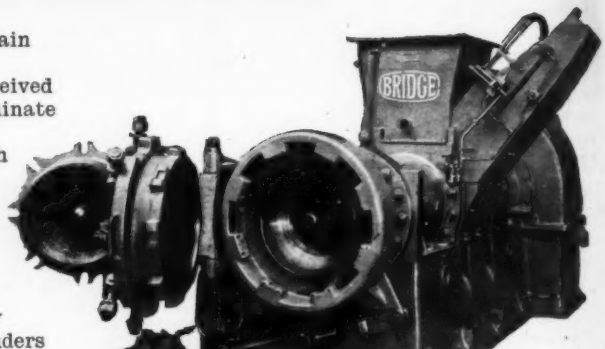

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NOTES of the WEEK

Show Place

OPPORTUNITIES to promote exports and to impress overseas buyers are being lost by lack of exhibition space according to a report prepared by an independent ten-man working party published at the beginning of this week by the Federation of British Industries. The need for a comprehensive showroom for British goods in central London, bigger than Earls Court or Olympia and on a par with Hanover or Dusseldorf, has been suggested often enough before. Sir Cecil Weir, chairman of the working party, and former Dollar Exports Board chairman, states in the report: ' We want a site larger than anything we have at present. It would have to be equipped with heavy cranes so that we could show off our heavy industry and not just our consumer goods.' As the report goes on to stress, the need for such a centre has now become urgent. Certainly it is essential for the UK not only to maintain but to increase its share of world exports of manufactured goods. The suggestion made in the report (' Export Trade Facilities ') is that such a centre should be financed jointly by the Government and by industry; possibly through a limited company issuing shares. A parallel suggestion is that there should be more Government financial help at world exhibitions. There seems little doubt that conveniently sited trade fairs, whether general or specialized, attract custom, and the fashion, like the size of the exhibitions, is growing. Next June's International Plastics Exhibition at Olympia is a case in point: more exhibitors, more space booked and, without any doubt at all, more buying visitors. In introducing the FBI report, Sir Cecil Weir said that the world was changing in ways not always to our commercial advantage. ' We cannot rest on past achievements,' he said, ' or assume that because we held certain markets in the past we can continue to hold them. Our competitors are not only more numerous but more able.' A large exhibition site in central London could give a tremendous boots to our exports by attracting world buyers. The arguments in its favour are unassailable but it must be really central. Perhaps the area on the south bank of the Thames, between Waterloo and London Bridges, could be one of the strongest candidates.

Co-operation

WHAT could be described as an ' employees ' annual general meeting was held recently by the well-known Gloucestershire engineering company of T. H. and J. Daniels Ltd. This marks a point on the road to employer/employee co-operation reached by very few industrial concerns although in this case it is an innovation that follows logically enough the company's many years' experience of personnel relationships policies. Some 12 years ago, the Company began to introduce methods by which employees were kept in touch with common problems. Groups were sent on work study courses and works conferences were organized. Through these and other methods, the men began to think co-operatively and to consider problems from this point of view—' our problem ' rather than ' their problem.' One of the results of this training and education scheme has been that the company were able to introduce last year a ' share of production ' plan which takes into consideration such factors as quality and proper use of materials. Although the plan means automatically more pay for greater productivity it is essentially more complicated than a straight time bonus. Effect of the plan on timekeeping and good housekeeping is reportedly good, with a growing realization that wasteful methods must adversely affect the common good.

Run Fast

GOOD research, good technology, good personnel policies and good commercial exploitation of products were four requirements essential for the health of British industry, suggested Sir Walter Worboys, commercial director of I.C.I., at the annual conference of the Advertising Association. He went on to stress the point, made many times in these columns, that we no longer have a sellers' market. Selling, he said, requires imaginative thought. The amount and calibre of the competition we have to meet is increasing. He concluded, ' We live in fast times. One has to run fast to stay in the same place. One has to run very fast indeed to get anywhere.'

Plastics History

THE permanent exhibit at the Science Museum, London, which is being prepared by the British Plastics Federation on behalf of the plastics industry, is to include a display entitled ' The History of Plastics.' The intention is to show as many historical exhibits as possible. It would be appreciated if any readers of the Journal who may have items of historical interest, and would be prepared to loan or present them for exhibition purposes, would get in touch with Mr B. C. Aldis at the Federation's offices at 47-48 Piccadilly, London, W.1.

NEWS *Briefs*

BRAZILIAN PLASTICS — FRENCH TYRE OUTPUT
INDONESIAN RUBBER FOR RUSSIA — US STRIKE
POLISH SR PLANS—AUCKLAND FORMICA PLANT

●**United Kingdom**—Orders for thermoplastic extruders for shipment to Italy and the Argentine have been secured by Fawcett Preston and Co., of Bromborough, Cheshire, one of the Metal Industries Group. One of the machines will go to Pirelli in Buenos Aires, another to Pirelli in Turin and the third to Cavi Electric, also in Turin. Value of the equipment, which is designed for covering cable with plastic, is put at £23,000.

●**Brazil**—Cia. Petroquimica Nacional 'Copenal,' Rua Washington Luiz 236, Sao Paulo, has been established in Sao Paulo with a capital of Cr.$2m. The firm has been set up by Bakol SA, Trol SA, and other firms of the Ralph Rosenberg Group. The new firm will manufacture plastics and particularly polythene. The firm holds licences from Chemische Werke Huels, Germany.

●**New Zealand** — De La Rue is to build a factory on a ten-acre site near Auckland for the manufacture of formica plastics. It will cost between £300,000 and £400,000.

●**Malaya** — The National Union of Plantation Workers, Malaya's largest union, has announced proposals for a 'closed shop' system. If the proposal is accepted, all the 320,000 estate workers in Malaya will be brought into the Union's books and their monthly dues collected by employers on behalf of the Union.

●**China**—The Italian ANIC—a firm controlled by the Italian-owned ENI (National Hydrocarbon Corporation) has signed a contract with the China National Import Export Corporation for the supply of 5,000 tons of synthetic rubber produced by the Ravenna factory of ENI.

●**Turkey**—The Turkish Government has approved a proposal by Dunlops for the construction of a tyre factory in Izmit. The factory is to start its activity in 18 months, and will produce 250,000 tyres, of which 50,000 will be for tractors and the rest for cars and trucks.

●**South Vietnam**—Exports of rubber in 1958 fell to 69,000 tons compared with 74,000 tons in 1957, the Board of Trade reports. Replanting is, however, on the increase; a number of loans have been made to plantations to assist in development and there are hopes of a gradual upturn in production as from 1959.

●**Poland**—A conference was held at the Polish Ministry of Chemical Industry recently on future plans for the synthetic rubber industry. The first Polish plant will be completed at Oswiecim chemical works this year and an output of 1,500 tons is planned by the end of the year. Production in 1960 should reach 20,000 tons and thereafter should proceed at a rate of 36,000 tons per annum. It will be based primarily on synthetic alcohol.

●**United States**—General Tire and Rubber Co. reports that earnings in the first fiscal quarter—ended February 28—were the highest for any quarter in its history and 'we are well on our way to our best year.'

●**Poland** — Production of phenolic synthetic resins in Poland in 1957 totalled 14,567 tons compared with 4,290 tons in 1955. Moulding powders totalled 4,778 (2,886 tons), and polyvinyl chloride, 166 tons. There was no PVC produced in Poland in 1955.

●**United States**—Representatives of the US Rubber Co. and the United Rubber Workers' Union met briefly on Tuesday afternoon, with neither side reporting any progress on the strike which is affecting 25,000 workers in 18 plants of the US Rubber Co. The firm has been negotiating a company-wide contract for five weeks as well as its pension, insurance and severance pay agreement and its supplementary unemployment benefit plan. Wages are not an issue. Initial talks were broken off on Thursday April 9 and the strike started at midnight.

●**Egypt** — The Egyptian Ministerial Economic Commission has allocated E£3,000,000 for the importation of a wide variety of goods. Of this amount, E£400,000 will be for natural and synthetic rubber.

●**Indonesia** — The Soviet Union has agreed to buy at least 14,000 tons of Indonesian rubber this year on favourable terms to Indonesia, according to Indonesian Trade Ministry sources in Djakarta. The sources said that, according to an agreement reached between the two countries earlier this year, Indonesia would receive 90% of the price of the rubber as soon as it was delivered on board. Prices would be based on Singapore quotations and payment would be made in transferable sterling against a letter of credit.

●**France**—Production of tyres in France in 1958 totalled 234,743 tons, as against 220,292 tons in 1957.

'Prototype of the new model—forget you ever saw it!'—435

Acetal Resin for Engineering*

REPLACEMENT OF NON-FERROUS CASTINGS

DELRIN acetal resin, a super-polyoxymethylene, has been designed for engineering application. It possesses unusually high tensile strength, rigidity, and resistance to deformation at elevated temperatures. Frictional properties are excellent (approaching the fluorocarbons), electrical properties are good (in general equivalent to nylon and PVC) and its resistance to creep, particularly above 150°F. is far superior to most other thermoplastics.

Data are presented which make it possible to design parts that will maintain specified tolerances in varying environments of moisture and temperature. Delrin affords the designer economies in the replacement of metals such as some types of zinc and aluminium die castings, brass castings and screw-machine parts, some sintered metal parts, stainless-steel and some carbon-steel applications involving high machining costs. Potential savings can be assayed by an examination of existing parts as well as new designs for applications in Delrin.

As An Engineering Material

Two series of resins will be marketed in 1959: Delrin 500 for general purpose moulding; Delrin 507 for general purpose moulding where weatherability is required; Delrin 150 for general purpose extrusion.

Delrin is lighter than any of the die casting alloys:

TABLE 1

	Specific gravity
Delrin	1.42
Magnesium die-casting alloy ..	1.81
Aluminium die-casting alloy ..	2.65
Zinc die-casting alloy	6.6
Brass casting alloy	8.5

Table 1. Comparison of the specific gravities of Delrin and other materials

When these comparisons are considered on a joint basis of weight, stiffness and strength, Delrin (unlike most other thermoplastics) is in a position to challenge these metals for many applications (see Fig. 1).

Pump impellers of brass or bronze and other similar parts where high strength and stiffness are required in the presence of water offer excellent opportunities for Delrin.

Expensive trimming and buffing operations necessary to obtain attractive die-cast parts are eliminated. Since Delrin has good electrical properties, it should be possible to gain another assembly advantage by combining electrical circuits with this part. The natural white, sanitary appearance of the polymer combined with stain and creep resistance at temperatures above 150°F. make it an excellent candidate for dishwashers and clotheswashers. In addition to being more economical than stainless steel, Delrin does not mark and chip dishware.

An indication of the 'economic incentive' afforded by Delrin in the zinc and aluminum die-casting fields as well as for screw machine and cast brass parts, is given in the following comparison:

Part weight: 2oz. in Delrin (equivalent weight is 12.3oz. in brass, 9.3oz. in zinc and 3.7oz. in aluminium. Part volume: 50,000 to 250,000 units.

Fabrication

Delrin — injection moulded with part finished when it leaves moulding machine.

Zinc and aluminium—die cast:

Moderate finishing — Flash removal, plus several machining operations such as facing, reaming or tapping.

Extensive finishing—Chrome plating or a large number of machining operations requiring jigs and fixtures.

Brass—Cast brass part including flash removal and several machining operations or a screw machine part (credited for scrap value of turnings).

The use of Delrin to replace these metals is potentially lucrative. Combining several different functional metal components into one moulding offers additional savings by reducing assembly costs. The price history of new plastics has been downward while that of metals, in general, has been unstable.

The determination of the 'technical incentive' (how well does it perform?) is a very important area of product development, where skill and experience with plastics coupled with creative engineering play an active role. Injection-moulded plastic parts are generally produced in high volume, and errors in part design are therefore multiplied accordingly. Realistically testing the prototype under actual operating conditions is the best means for proving out the 'technical incentive' prior to commercialization.

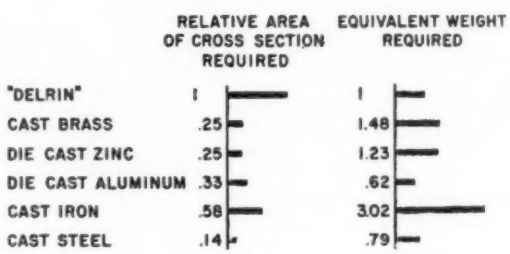

COMPARISON FOR EQUAL STRENGTH IN TENSION
(ROOM TEMPERATURE)
RELATIVE AREA OF CROSS SECTION REQUIRED
EQUIVALENT WEIGHT REQUIRED
"DELRIN" 1 1
CAST BRASS .25 1.48
DIE CAST ZINC .25 1.23
DIE CAST ALUMINUM .33 .62
CAST IRON .58 3.02
CAST STEEL .14 .79

Fig. 1. Delrin compares favourably with other materials for many applications

To produce a well-designed part in Delrin (or any other material), the designer must have access to published design and engineering data. Much time and effort can be saved in the preparation of preliminary drawings (and prototypes based on these drawings) by applying the data in table 2. Initial prototypes in Delrin can be obtained in several ways. Machining from sample stock on a duplicator using the metal unit as a master is one method. For new designs where a master does not exist, conventional machine-shop tools can be used. Delrin machines easily (similar to free-cutting brass). As mentioned previously, die-casting moulds serve as another convenient means for obtaining test parts.

Owing to the difference in mould shrinkage (solidification shrinkage in die casting) for die-cast metals and

*Extracts from a paper entitled 'Designing with "Delrin" Acetal Resin,' which was presented at the annual meeting of the American Society of Mechnical Engineers in December by Watson C. Warriner, E. I. Du Pont de Nemours and Co. Inc. ASME paper No. 58-A-259.

Delrin (0.012 in/in. versus 0.020 in/in. average) dimensions for parts in Delrin usually will be smaller. This difference usually can be tolerated or, if not, compensated for by a few simple improvisations commonplace in prototype and model work.

It is not recommended that prototypes be obtained in Delrin by the compression or transfer moulding process. Inferior parts are usually obtained.

A quick characterization of Delrin can be obtained by reviewing typical properties shown in table 2. However, for actual design purposes the design engineer needs graphical data which show the variation of physical properties with environment and time. With this information the designer can more confidently select physical values pertinent to the particular environment in which the part is to function.

TABLE 2

Property	Units	ASTM No.	Average Values for 'Delrin' 500X	150X
Elongation, 73°F.	%	D638	16	75
158°F.	%	D638	330	460
Impact strength, Izod, –40°F.	ft.lb./in.	D256	1.2	1.8
73°F.	ft.lb./in.	D256	1.4	2.3
Tensile strength and yield point, 73°F.	psi	D638	10,000	
158°F.	psi	D638	7,500	
Flexural modulus, 73°F.	psi	D790	410,000	
Flexural strength	psi	D790	14,100	
Fatigue endurance limit, 73°F., 100% RH	psi		5,000	
Shear strength	psi	D732	9,510	
Heat distortion temperature, 264 psi	°F.	D648	212	
66 psi	°F.	D648	338	
Deformation underload (2,000 psi at 122°F.)	%	D621	0.5	
Compressive stress at 1% deformation	psi	D695	5,200	
Water absorption, 24 hours' immersion	%	D570	0.4	
50% RH (equilibrium)	%	D570	0.2	
Specific gravity		D792	1.425	
Rockwell hardness		D785	M94, R120	
Flammability	in./min.	D635	1.1	
Melting point (crystalline)	°F.		347	
Flow temperature	°F.	D569	363	
Coefficient of linear thermal expansion	per °F.	D696	4.5 × 10^{-5}	
Thermal conductivity	B.Th.U./hr./sq.ft./°F./in.		1.6	
Specific heat	cal./gm.		0.35	

Table 2. A quick characterization of Delrin can be obtained by reviewing typical properties

Strength and Stiffness

Delrin is one of the strongest of all thermoplastics. In Fig. 2, the effect of temperature on yield strength is shown. Delrin, unlike most thermoplastics, exhibits a high yield strength at 250°F. The tensile strength of Delrin is affected no more than 10% by the presence of moisture.

Creep

Creep occurs in virtually all plastic materials under load at room temperature just as with some grades of lead and aluminium. Delrin has outstanding resistance to creep particularly at temperatures of 150°F. and higher. This desirable engineering property is compared with some other well-known plastic materials in Fig. 3.

In Fig. 4 the apparent modulus is plotted versus stress level for various times of loading. It is interesting to note that for all practical purposes for any given time, a single value for the apparent modulus of elasticity up to a stress level of 2,000 psi can be used with reasonable accuracy.

Because of these properties, Delrin has been found to be technically sound (also with good economics) for replacing metal plugs in some hydraulic lines and crankcase applications.

Gears

Gear applications are varied in their requirements and many gear-tooth profiles prove satisfactory in service. Experience has shown that good results can be expected from a 20° full-depth tooth, since this profile provides a strong tooth with good gear geometry.

Frictional and Bearing Properties

Delrin has a very low coefficient of friction as shown in Table 3. In addition, it has the unusual property of having the same value for both the static and dynamic coefficient of friction. This eliminates 'slip-stick' which is a problem in some applications involving friction. Little change is noted in the coefficient of friction over a wide temperature range of 73° to 250°F. and up to a bearing load of 2,500 psi. It has been reported on several occasions that Delrin operating as a dry bearing against steel does not squeak which is a problem sometimes with other plastics.

Lawn mower and push cart wheels are other applications where this 'two-in-one' principle can be used. Tests indicate that extruded tubing of Delrin provides an excellent control-cable housing for throttle and steering controls.

Experience with Delrin has shown that no allowance need be made for dimensional changes caused by release of stresses as long as the parts are to be used at temperatures below 120°F. If service temperatures are higher, it may be necessary to anneal the parts after fabrication. The factors that determine the need for annealing are the amount of frozen-in stresses, the conditions of use and the tolerances required. The frozen-in stresses will vary both with fabrication conditions and with the geometry

TABLE 3

Conditions	Coefficient of friction* Static	Dynamic
Dry (73°F.)	0.1—0.3	0.1—0.3
Dry (250°F.)	0.1—0.3	0.1—0.3
Lubricated with water (73°F.)	0.2	0.2
Lubricated with oil (73°F.)	0.1	0.05—0.1

*Measurements were made by the inclined plane method.

Table 3. Coefficient of friction of Delrin on steel

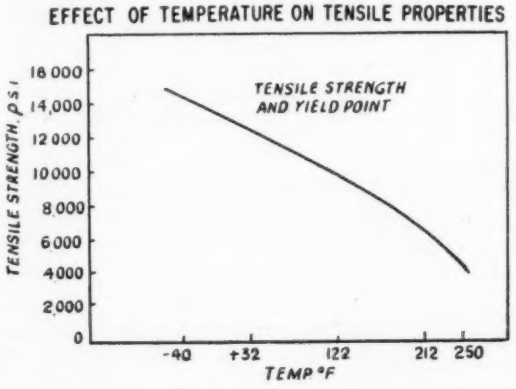
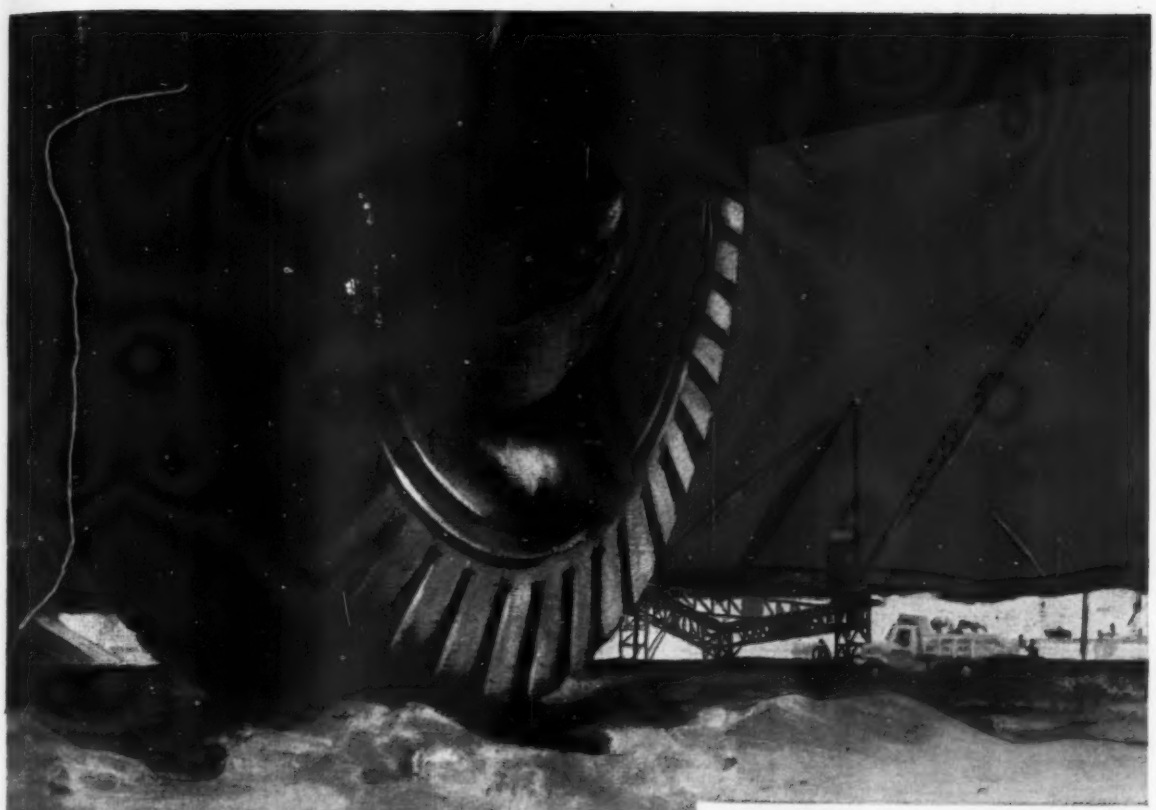
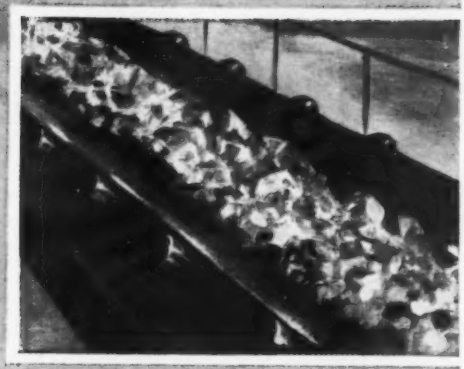


Fig. 2. The effect of temperature on yield strength



Nonox ZA



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of the part. With most parts, it can be kept to a minimum by the use of a hot mould (250°F.). Where close tolerances (±2 mils/in.) must be maintained at elevated service temperatures annealing may be desirable.

Parts of Delrin can be moulded to ±3 mils/in. for the first inch and ±2 mils/in. for each additional inch of dimension. At greater costs, parts can be precision moulded to ±2 mils/in. for the first inch and ±1 mil/in. for each additional inch of dimension. Since close-tolerance mouldings are more expensive, prototype work should include the accurate determination of what tolerances are actually required to give satisfactory performance.

Allowances for mould shrinkage should not appear on design drawings for moulded parts, since this allowance is made in the design of the mould by the moulder and tool maker. Delrin has an average mould shrinkage of 20 mils/in., however, it can vary from 15-35mils/in. depending on the geometry of the part.

Abrasion Resistance

Delrin exhibits very good abrasion resistance and in general is superior to most other commercially available thermoplastics. It is as difficult with plastics as it is with metals to take laboratory abrasion resistance data and relate it to specific design solutions. Experience has shown that prototype testing is the best means for establishing whether the material will stand up in practice. Where the ultimate in abrasion resistance is required, moulded parts of Delrin should be treated with oil which can be accomplished simultaneously with annealing.

Chemical Resistance

Resistance to both organic and inorganic chemicals is shown in Tables 4 and 5. Delrin is not recommended in contact with strong acids or bases, and actual field tests to determine performance should be conducted on parts exposed to weaker acids and bases.

Heat Resistance

Delrin shows no significant decrease in physical properties upon prolonged exposure to air in continuous service at temperatures up to 180°F. or in intermittent service at temperatures up to 250°F. In water continuous exposure to temperatures up to 150°F. can be expected to result in no significant reduction in physical properties.

Delrin offers some excellent opportunities in the plumbing, appliance and other industries where both hot and cold water are present. Extensive testing, simulating field conditions is again recommended to prove out these applications prior to commercialization.

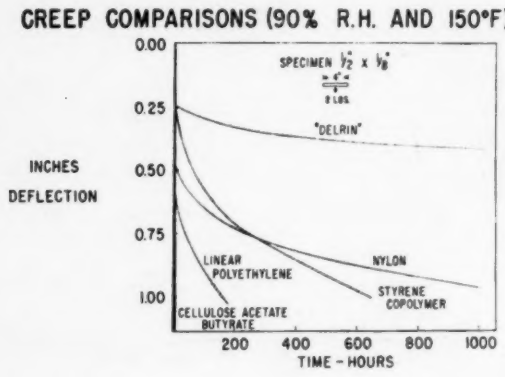

Fig. 3. Creep resistance compared with other plastic materials

Permeability

The permeability of Delrin is exceptionally low and has been found to be a fraction of that of polythene when exposed to aliphatic, aromatic and halogenated hydrocarbons, alcohols and esters. Permeability data for some organic liquids and water is shown in Table 6.

Electrical Properties

Delrin burns slowly at a rate of 1.1 ipm (ASTM-D-635-56T). This rate is comparable to polythene, polystyrene, cellulose-acetate butyrate, and acrylics which are in common usage throughout the electrical industry.

Weathering

Delrin like most other polymers, (acrylic resin and tetrafluoroethylene resin are exceptions) is affected by ultraviolet light. For outdoor applications continuously exposed to sunshine, a black composition (507X) containing carbon black gives excellent results. Ultra violet filters improve the weathering of coloured as well as natural colour compositions and look promising in current investigations. Tests have shown that Delrin does not lose its properties when buried underground, nor is it attacked by fungi, rodents, or insects.

TABLE 4

Reagent	% Change in 12 Months: Tensile Strength, Room Temp.	Tensile Strength, 158°F.	Weight, Room Temp.	Weight, 158°F.	Length, Room Temp.	Length, 158°F.
50% Igepal	+2	−58	−1.8	+0.1	+0.05	−1.21
'Nujol'	+1	+2	+0.3	−0.5	−0.08	−0.37
'Uniflo' motor oil 10W30	—	+3	—	−0.2	—	−0.30
Carbon tetrachloride	−3	−7*	+1.2	+5.7*	+0.30	−0.25*
100% Ethyl alcohol	−5	−5*	+2.2	+1.9*	+0.81	+1.00*
Acetone	−5	−7*	+4.9	+2.6*	+0.91	+1.08*
5% Acetic acid	0	−8*	+0.8	−2.6*	+0.15	−0.22*
Toluene	−7	−7*	+2.6	+2.8*	+1.20	+1.20*
'Super 9' brake fluid	—	−6	—	+1.6	—	+0.57
'Lockheed' 21 brake fluid	—	−23	—	+0.9	—	+0.29
Ethyl acetate	−7	−7*	+2.7	+2.9*	+1.35	+1.10*

* Because of difficulties in carrying out the test these samples were tested at 122°F. instead of the higher temperature.

Table 4. Resistance to organic chemicals. Test conditions: 1. Bars were completely immersed in solvent for the time indicated; 2. Tests were made by standard ASTM procedures at room temperature immediately after removal of bars from solvents

TABLE 5

	% Change in six months: Tensile Strength, Room temp.	Tensile Strength, 158°F.	Weight, Room temp.	Weight, 158°F.	Length, Room temp.	Length, 158°F.
30% Sulphuric acid	−>30	—	−48	—	—	—
10% Nitric acid	−>30	—	−70	—	−1.00	—
10% Hydrochloric acid	−>30	—	−84	—	−1.91	—
10% Sodium hydroxide	0.0	—	+0.01	1	+0.02	—
10% Sodium chloride	0.0	+1.0	+0.05	+0.02	+0.01	0.00
Buffer solution, *p*H 4	—	−>60	—	−>20	—	—
Buffer solution, *p*H 7	—	−1.0	—	−0.05	—	−0.22
Buffer solution, *p*H 10	—	−3.2	—	−0.83	—	+0.02

Table 5. Resistance to inorganic chemicals. Test conditions as for Table 4

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Machining

Delrin is easily machined (similar to free-cutting brass) on standard machine-shop equipment by sawing, milling, turning, drilling, reaming, shaping, threading and tapping. At low speeds no coolant or lubricant is necessary; however, improved machining can be obtained by using these aids at high cutting speeds. Delrin can be blanked and punched to produce small flat parts such as washers, grommets, actuator cams and nonprecision gears. Cracking usually can be avoided by preheating the sheet slightly.

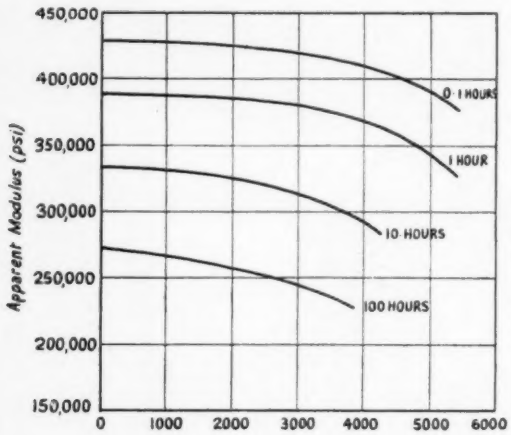

Fig. 4. Modulus versus stress for various times of loading

Hot Plate Welding

This technique involves pressing two pieces of Delrin to be joined against a hot plate to melt them, after which they are pressed together.

Hot-Wire and Induction Welding

This process involves placing a wire (or wires) between the two pieces of Delrin forming the joint and passing a current through the wire until the heat melts the adjacent plastic material. Welds of this type have a shear strength of 750 psi per in. of imbedded wire.

Induction welding can be accomplished by inserting a metal ring (perforated if a stronger joint is required) in the joint and placing the joint in an electromagnetic field. This method produces joints with the metal ring completely enclosed in Delrin.

Spin Welding

Joints can be made in circular objects by holding one section and rotating the mating section against it under slight pressure until frictional heat melts the interface. When this occurs, rotation is stopped and the two faces form a weld of very high strength. This operation is fast and adaptable to production-line methods.

TABLE 6

Liquid	'Delrin' P Factor*	Regular polyethylene P Factor*
Methyl salicylate	0.27	9.1
Toluene	0.65	566.0
Turpentine	0.023	47.0
Ethanol	0.22	—
Water	3.0	0.35
'Perclene' (chlorinated hydrocarbon)	0.23	—
'Freon' 12/114	0.33	—

* P Factor is defined as the grammes lost per 24 hours per 100 sq. in. area per mil wall thickness. This factor permits the calculation of the loss that can be expected from any given bottle.

Table 6. Permeability to organic liquids and water. Test conditions: containers, sealed 4oz. round bottles, blow moulded; temperature, 73°F.; humidity, 50% rh

Self-Tapping Screws

Delrin, owing to its excellent machining properties and creep resistance, easily accepts and permanently holds self-tapping screws.

Press-Fitting

Owing to its strength and excellent resistance to creep, Delrin can be joined to other materials by press-fitting and snap-fitting. For instance, a steel shaft can be pressed into a gear or other part of Delrin with good results.

Snap-fitting two parts of Delrin together can be done by moulding a slight undercut in one part with a matching projection on the other part. When assembled the two parts deform temporarily until the undercut and projection match up, whereupon they snap into the mating position.

Cementing and Solvent Welding

Lap joints of Delrin using various cements are not too satisfactory, since joints of low bond sheer strength in the range of 300-500 psi are produced.

Annealing

Delrin, like metals, will retain some internal stresses when it is fabricated (moulded or extruded). Sometimes, it is desirable to relieve these stresses where the ultimate in dimensional stability and abrasion resistance is required. This can be accomplished by immersing the parts in a heated oil bath.

HEAVY DUTY ROTARY CUTTERS

Specially designed to deal with the increasing toughness and size of modern plastics materials and mouldings, a new range of steel construction, heavy-duty granulating machines is being manufactured by Blackfriars Rotary Cutters Ltd., Blackfriars House, New Bridge Street, London, E.C.4.

Special knives are fitted to give increased strength and improved cutting action. Throat openings of 8in. x 4½in., 10in. x 18in. and 16in. x 26in. are available, and this range enables the handling of a wide variety of materials in many forms. One model is specially designed to granulate such large mouldings as buckets, baths, large polythene bottles, etc. There is also a model which will accept large lumps of solid plastic without any pre-cutting by saw or other means. In addition to the usual plastic materials these machines will also cut up large slabs of rubber.

Administration and Management*

COSTING AND COMMERCIAL CONSIDERATIONS—3

ALTHOUGH other aims existed, the prime object of industry was to make profit, said Mr A. B. Merriam, of Halex Ltd., in his lecture at the National College of Rubber Technology, and all other aims were dependent on the making of profit without which any industrial unit would ultimately fail.

The two basic elements in making a company profitable were, firstly, using the available resources to the best advantage and, secondly, producing and selling as efficiently as possible. The first involved choosing and planning work which could be performed profitably, a matter which put the technical and commercial skills of the company to the test. The decision to quote and lay down a plan of production was vitally important. If this decision was correct, successful production with profitability would depend on the productive efficiency, but faulty judgment at this stage may lead to constant difficulty and loss of expected profit whatever the productive efficiency may be. Hence such decisions were matters for high level management. The planning and checking of a highly efficient system of production was the main purpose of a costing scheme.

Choosing the Jobs

There was an ever-present need to fill the factory with profitable jobs but during periods when machines were standing idle it may be better to accept orders at prices which promise little or no profit in order to recover overheads and keep the labour force engaged. At busy periods it was possible to reject such marginal jobs. Also, as the profit margin varied from job to job, there was a desire to choose those jobs which offered maximum profitability.

Besides showing a predictable profit a job must be a good moulding proposition. It should yield a turnover related to the technical effort and cost entailed in setting up and tooling. In some quarters specially critical scrutiny was given to any enquiry which promised a turnover of less than five times the value of the tooling.

Moulding equipment was not earning while stopped for tool changes, yet most of the expenses continued. So, for maximum efficiency of production, there must be the minimum of idle time and the job must be long running. The price charged should include allowance for tool change.

The suitability of the machine to do the job was a third important consideration, said Mr Merriam, and when a choice of suitable jobs was available preference was given to the one which involved the maximum throughput of plastic material. Running an injection machine cost the same for labour and overheads every day, but the value of the output increased, and therefore the legitimate profit increased as the volume of material increased.

Product Cost

The factory cost was taken to mean the cost incurred up to the stage of transferring the product from the production department to the warehouse. This did not include cost of administration, pension tax, cost of packaging, transport or selling, nor profit.

In calculating material cost, allowance for material scrapped during the run varied from 2% for a simple, long-running job to perhaps 25% for a critical job where recovery of material was impossible.

As material cost averaged about 50% of the total, economic purchasing and usage were essential. Moulders were faced with an ever-growing number of different thermoplastic materials and grades; these entailed increased investment in stocks and also set change-over problems to moulders.

Direct labour could be described as that which directly increased the value of the product. Such labour could be paid at a time rate or an incentive bonus scheme could be operated. Mr Merriam, briefly discussing the pros and cons of these systems, suggested that, although an incentive scheme provided the means of achieving higher production rates, it also gave rise to more arguments over wages and a higher percentage of rejects, so that he was not completely convinced of the overall advantages from the cost point of view.

The third component of cost was the oncost and this was the most difficult to control. Explaining depreciation, the lecturer said that all money invested in the company must, by law, be accounted for at any time. As buildings and plant become older their value depreciated and money must be put aside each year to maintain their value. This depreciation may amount to about 15% per annum and the sum set aside was spent on replacements and improvements.

Rent, rates and insurances also formed part of the oncost, together with development costs, which, in the plastics moulding industry, were largely for improvement of machinery to cope with the new materials as they came along. Costs of electric power, steam and water, and repairs and maintenance of machines and tools formed a large item in connexion with injection moulding. All indirect salaries and wages including management, accounting and inspection, and also holiday pay, National Insurance contributions and all other miscellaneous outgoings must be included.

It would be an impossible task to estimate all these individual items likely to be incurred on any one job, so they were usually totalled and the oncost on any given article calculated either as a press rate or as a percentage of direct labour. It was important to realize that when the factory was busy, increased production would recover more oncost but this was offset by the incomplete recovery during slack times.

Mr Merriam dealt with many questions from his audience and concluded his remarks by emphasizing that injection moulding was a highly competitive business, run mostly with narrow profit margins but it was an expanding and a challenging business.

Third in the current series of evening lectures on 'Some Aspects of Administration in the Rubber and Plastics Industries' at the National College of Rubber Technology.

Negri Bossi (England) Ltd

A new company, Negri Bossi (England) Ltd., has been formed as a result of an agreement between J. Evans and Son (Portsmouth) Ltd., and the Italian injection moulding machine manufacturers—Negri Bossi and Co., of Milan. The new company will distribute in the UK, British Commonwealth and the Scandinavian countries the moulding machines now in production in Portsmouth. At present two models are in production, a 1.1/6oz. machine the NB/30 Record and a 2.1oz. machine the NB/60E. The future programme provides for the eventual manufacture of the entire Negri Bossi range including extruders and bottle blowing equipment. In the meantime Negri Bossi (England) Ltd., will act as distributors for those machines still made in Italy.

Plastics in Canada

FAST-GROWING INDUSTRY

CANADA'S plastics industry's burgeoning has been one of the outstanding features of the Canadian manufacturing scene in recent years. This is remarked in Bank of Nova Scotia Monthly Release for February.

Close to two dozen primary plastics plants have been built since the war, and some of them enlarged after only a few years. At the same time there has been a remarkable expansion in the secondary plastics industry all across Canada, the number of specialized fabricators increasing from 81 in 1947 to 196 in 1957. And this represents only part of the expansion, since a great deal of the processing of plastics takes place in the rubber, electrical, paper, leather, clothing, paint, adhesives, toy and other industries.

Behind this expansion lies the rapid postwar growth of the Canadian market and the swift advances in knowledge of how to make and use the new materials. The close connexions of the chemical industry in Canada with US and British companies have meant, states the report, that as research has led to new developments in plastics in those countries and elsewhere these have spread quickly to Canada. Often a plastic material has first been imported; then, as demand increased, production has been established in Canada. In considerable part, too, the growth in the primary plastics industry has reflected the availability of raw materials resulting from such developments as the wartime establishment of a Canadian synthetic rubber industry, the big expansion in the petroleum refining and the oil and gas discoveries in the West.

Relatively Small Market

Striking though the record of expansion is, all has not been clear sailing for the Canadian plastics industry. Even with the recent substantial growth in the Canadian economy, the Canadian market for primary plastics is still relatively small and in some cases, of course, export markets may provide a supplementary outlet until such time as the Canadian market is adequate. In the past few years, exports have accounted for around 30% of Canadian production of primary plastics, though there has been considerable variation in total exports from year to year and even wider swings in individual markets.

A substantial volume of polystyrene has been exported, some polythene and lesser quantities of other synthetic resins. With strong world demand for plastics and the rapid build-up in capacity in this country, the export situation has been quite favourable, although keenly competitive.

In the domestic market, too, Canadian producers are subject to the pressures of world competitive forces, which are felt both in the structure of prices and in direct import competition.

Four major plastics — phenolics, vinyls, polystyrene and polythene — account for the lion's share of both production and consumption in Canada. The phenolics, initially produced in Toronto in 1911 and the first to reach volume markets, still rank high, though their growth in recent years has been comparatively modest.

Unlike the phenolics, the three other major plastics have come into prominence in the postwar years. The vinyls have shown quite remarkable growth and continue to move strongly ahead. Production of polystyrene quickly followed the end of the war, stimulated by the availability of surplus styrene at the wartime synthetic rubber plant at Sarnia (of crown-owned Polymer Corp.). However, with competition from other plastics, polystyrene's growth in the last few years has slowed down, though a recent development is a plant to produce polystyrene foam.

Polythene Expansion

In the last few years, the fantastic growth in polythene has overshadowed all other plastics. Canadian consumption soared from around 10,000,000lb. in 1954 to 45,000,000lb. in 1958. Expansion programmes for production of polythene now under way will bring the capacity to 80,000,000lb. this year.

Close on the heels of the remarkable growth of polythene has come development of the new linear polythene. Two plants are being built at Sarnia.

In addition to the four principal plastics, Canada produces a number of other types. The alkyds, polyesters, nylon moulding powder, and urea adhesives. Two further plastics which have recently come into production are urethane foam and epoxies.

Among the more important plastics which are supplied entirely by imports are melamine moulding powders, the acrylics, polyvinyl butyral and certain types of cellulosics. In time, as the domestic market grows, some of these materials and other new types are likely to be added to the list of plastics manufactured in Canada.

Plastics are now clearly established in many uses and are obviously far from having reached their full potential. Moreover, it is quite likely that some new and startling applications will turn up in the years ahead. Already plastics are being used in missile cones, where advantage is taken of the fact that they have very high heat resistance for short periods. Experiments are being made with the use of plastics to produce an automobile that will not require greasing. In construction and in the pipe market only limited and special use of plastics has so far been made.

Of special interest in Canada are the experiments with polythene tarpaulins as coverings under which winter construction may be carried on, and with polythene pipe to keep harbours free of ice by introducing air bubbles and thus forcing the warmer water up from the bottom.

The review adds that while fruitful in new developments, there has been at times a build-up in capacity outpacing market demand, but there seems to be no doubt that the long-term trend of growth will be strongly upward.

For instance, Canadian polythene producers have set their sights on a 20 to 25% sales gain in 1959. This plastic has been forging ahead at 20 to 40% gains each year for the last five years and it is still Canada's fastest-moving chemical item. Each year sees the development of new market applications for the product and point to the tremendous potential in the multi-wall paper bag market. An estimated 250 million of these bags are used annually in Canada to package anything from potatoes to fertilizer.

Canada's first two producers of this new polythene will come into initial production this year. They are both located at Sarnia, Ontario, the Dow Chemical of Canada and Du Pont of Canada.

The other two Canadian manufacturers of the earlier product, Canadian Industries Ltd., at its Edmonton, Alberta, plant, and Union Carbide Canada, in Montreal East plant, show little concern about possible inroads into their market from the new production. Both companies will have expanded their capacities by this year end to about 40,000,000lb. annually, Union Carbide, and 44,000,000lb. Canadian Industries Ltd.

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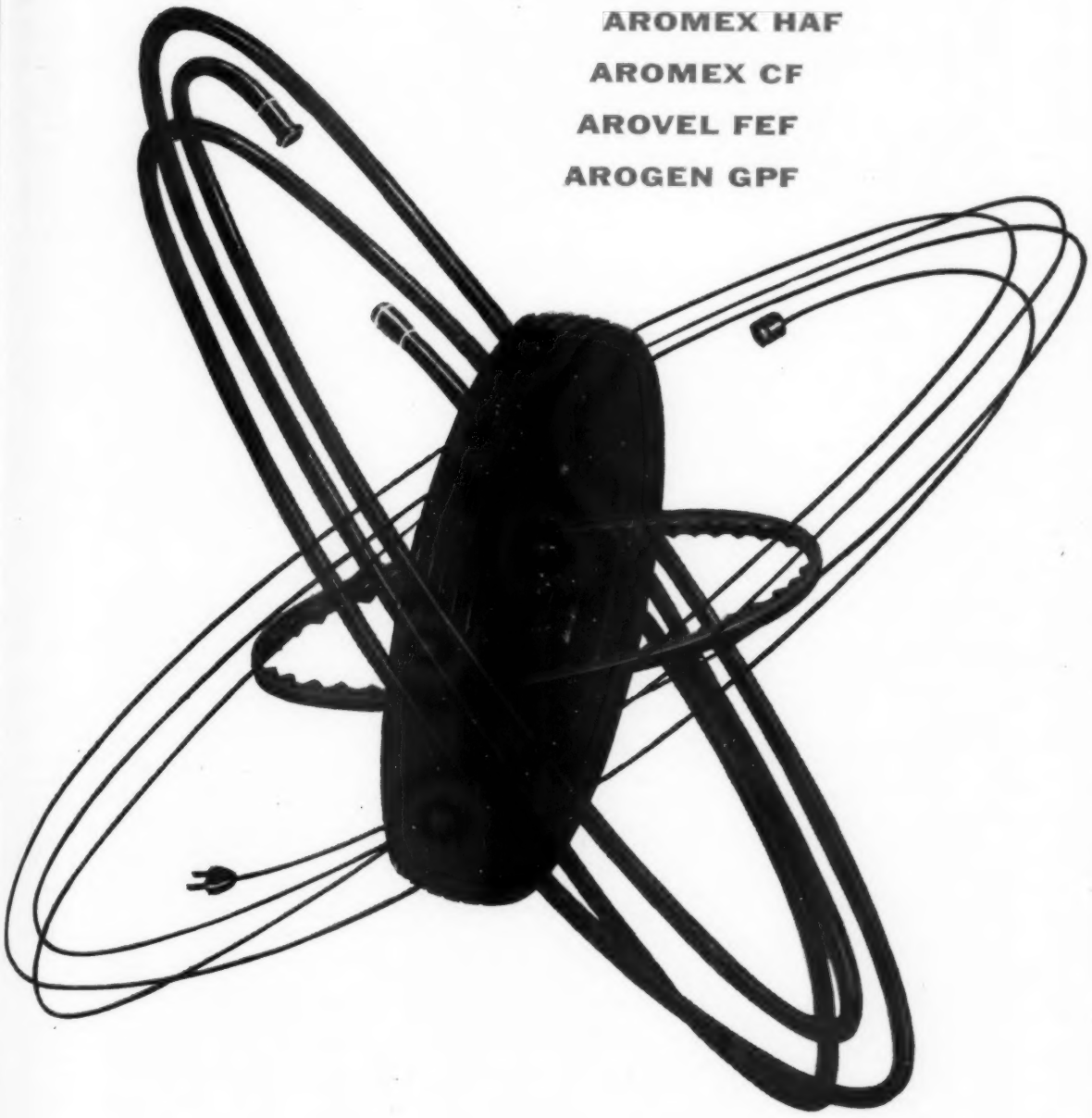

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Corrosion Exhibition

NEW PRODUCTS AND TECHNIQUES

PROBABLY the largest sectional increase in the numbers of exhibitors at the Corrosion Exhibition (Royal Horticultural Society New Hall, April 27-30) is among the plastics, plastics engineering and rubber manufacturers. Altogether there is a 50% increase in exhibitors.

A new Dunlop technique in tank linings is featured on the company's stand where a quarter section of a polythene-lined, mild steel tank, constructed with a rubber interlayer between the polythene and the metal is being shown. The interlayer acts as an expansion control and a medium for obtaining a high degree of adhesion. Previously, difficulties have been experienced in adhering polythene to steel.

Another exhibit is a reel tray for the production of viscous yarn, which is believed to be the largest solid ebonite moulding produced on a regular basis in this country.

Chemical plant made from Cobex (rigid vinyl) and Cobex expanded metal laminates will be featured on the BX Plastics stand along with plant made from Stelvetite, PVC-coated steel. Limpetite, a neoprene-base self-curing synthetic rubber which has its main application in combating salt water corrosion is to be shown on the stand of Protective Rubber Coatings (Bristol) Ltd. Nordac Ltd. are to display a Keith Blackman fan lined with Vulcoferran as well as a British LaBour centrifugal pump. Also among their exhibits will be small tanks lined with polythene and PVC. A. E. Griffiths (Smethwick) Ltd. are devoting a considerable amount of their display to PVC constructed plant, among which will be on show a 1,500 cfm fan and a fume scrubber unit.

Epikote Epoxy Resins

On the materials side Shell Chemical Co. Ltd. will emphasize their Epikote epoxy resins, Carina PVC and Carlona polythene. On plastics fabrication, Plastic Constructions Ltd., KW Chemicals Ltd., and Prodorite Ltd. will show some of their considerable range of products mainly concerned with fume extraction and tank linings. Both Prodorite and Plastic Constructions will particularly emphasize their resin-bonded glass fibre products, for which they are already well known. In the case of KW Chemicals, it is understood that a completely new range of special resin-bonded glass fibre pipe and fittings will be displayed.

The Anglo-American Synco Corpn. Ltd., a member of the BTR Group, will show neoprene-based coatings and their main exhibit will be a 30in. centrifugal pump casing which has been in operation for over 14,000 hours. BTR Industries Ltd., displaying their complete anti-corrosion service, will show rubber and ebonite compounds bonded to base metals as well as a display of high-impact PVC pipe and fittings and industrial hose in textile reinforced rubber, PVC and PTFE. Their flexible PVC jointing for acid-resisting bricks will also be shown. Among the many exhibits featuring PVC, that of Chemidus Plastics Ltd., will show their range of tubing and in particular Chemidus 2,000.

The Araldite range of epoxy resins will be shown by Ciba (ARL) Ltd., of Cambridge, and Detal Products Ltd. will display various protective paints made from epoxy resins, chlorinated rubber and other materials.

Hypalon and Viton

The Du Pont Co. (UK) Ltd. will exhibit their elastomers, neoprene, Hypalon and Viton, and typical examples of parts made from these materials and coatings will be shown along with practical examples of their application.

In the field of sprayed and dipped products Durable Plastics Ltd. will exhibit what is being done with regard to the use of polythene, PVC, nylon, PTFE and neoprene as finishes in combating corrosion.

H. Incledon and Co. Ltd. will show their range of fittings, including Durapipe V which is a new range since the last Corrosion Exhibition, this particular one being based on Geon RA170 PVC.

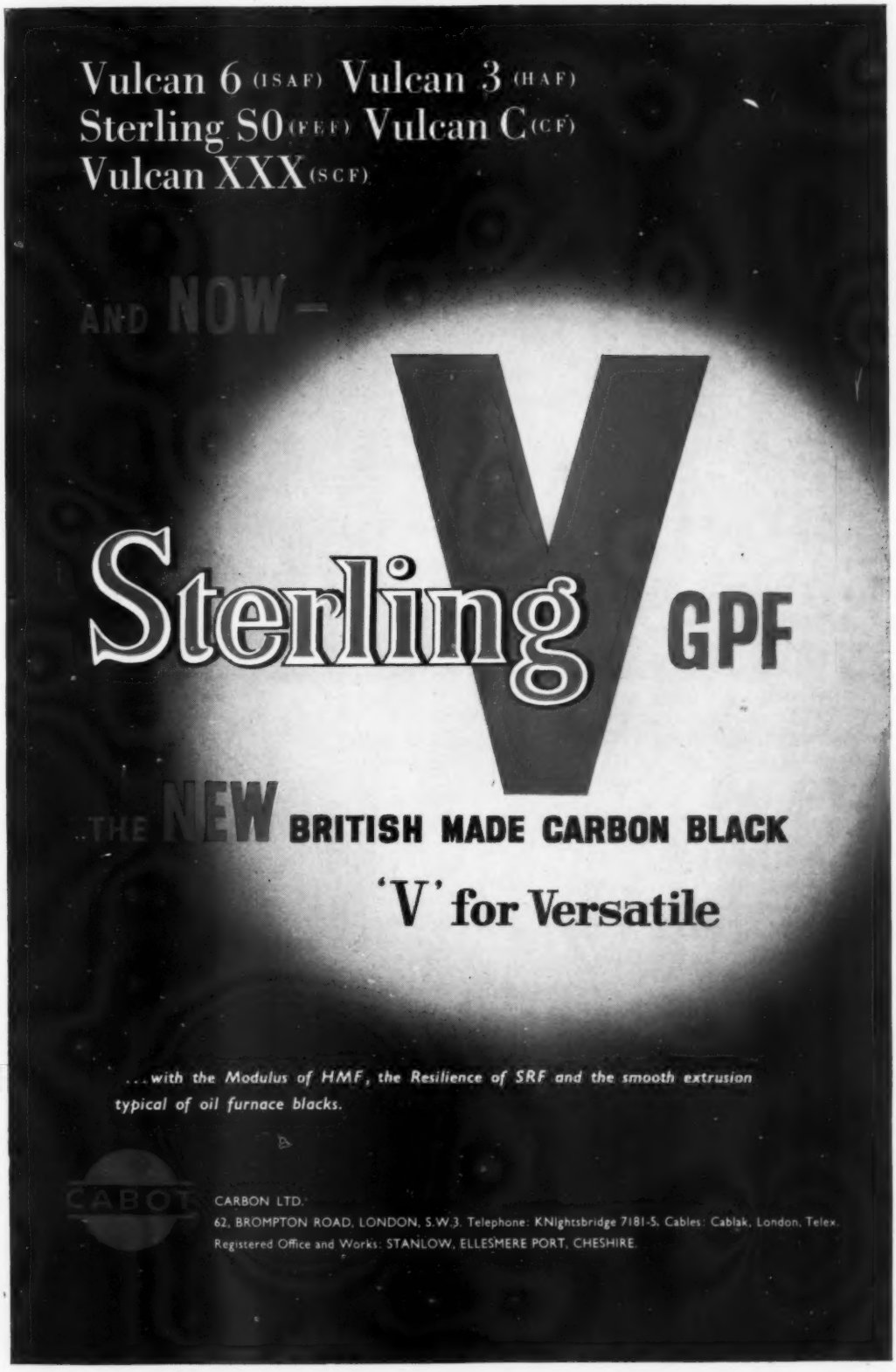
A new firm, Laminated Plastic Products Ltd., will show their developments in the field of asbestos-reinforced phenolic resins; a PTFE sealed plug cock and a number of impellers developed by the company.

The wide range of Cabtyrit compounds provides a solution to most problems of corrosion due to chemical attack. The range, to be displayed on the stand of the manufacturers, St. Helens Cable and Rubber Co. Ltd., comprises natural rubber, heat-resisting natural rubber, abrasion-resisting natural rubber, ebonite (hard rubber), ebonite (low-temperature vulcanizing), flexible ebonite, polychloroprene (neoprene), PVC, butyl and butadiene/acrylo-nitrile rubber.

The application of plastics, such as rigid PVC, polythene and glass-resin laminates to chemical engineering, is another aspect of the company's activities. The company is able to handle vessels of all sizes and has developed a special technique for lining pipes up to 20ft. in length. The exhibit lays emphasis pictorially on the facilities available for carrying out treatment at works or on site.

Main features on the stand of Fibreglass Ltd. will be the anti-corrosion protection of buried pipelines and some examples of industrial applications of fibreglass reinforced plastics, particularly for industries where corrosive liquors and fumes are encountered. There will also be examples of moulded tanks, pipework and a length of corroded steel pipe repaired with fibreglass reinforcement and resin, for which kits are now available.

About 200 guests, representing tyre manufacturers, motor traders and agricultural engineers, were recently entertained to dinner and cabaret in Shrewsbury. The occasion marked the presentation of the 'Blue Peter' Sales Cup to the Western Tyre Co., Shrewsbury. Mr W. G. W. Bird, managing director of Blue Peter Retreads Ltd., made the presentation and Mr C. H. Jones, manager, received the cup on behalf of Western Tyre Co.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VIEWS and REVIEWS

'Natsyn'

IN connexion with the development of manufacture of synthetic 'natural rubbers' based on polyisoprene, discussed mainly from the economical angle in 'Views and Reviews' of April 11, C. T. Winchester (Goodyear, Akron, Engineering Dept.) has contributed an interesting paper entitled 'Natsyn Pilot Plant' to *Industrial and Engineering Chemistry* (1959, *51*, 19).

The said article, *inter alia*, features a number of attractive photographs of pilot plant detail such as those relating to the 500-gallon stainless steel reactors, the weighing of materials, cleaning of plant, withdrawing sample by means of a hypodermic syringe, and handling of catalyst. It may be interesting, if premature, in this brief account, to say a few words as to the latter.

The Catalyst

With regard to the nature of the catalyst the author remarks that 'Polyisoprene, which can replace or be used as an extender of natural rubber, depends upon a stereoscopic catalyst which will produce a high *cis*-1,4 polymer. Such a polymer can be made with Ziegler-type or lithium-derived catalysts. The Natsyn pilot plant is designed to use either type, but Ziegler is the one Goodyear prefers at the moment.'

Under one of the illustrations there is reference to the precautions available in case of mishap. Thus: 'Ziegler-type catalyst used for polymerization burns spontaneously in air. Material from storage cylinder at right (*of illustration*) is weighed into the pressure bomb which will be used to feed catalyst into the reactor. In case of fire aluminium shade at the top automatically drops to seal off where catalyst is handled and thus confines flames.'

Pilot Plant

The immediate aim of the Natsyn enterprise is expressed in the article quoted as follows:

'Sometime soon engineers at the Goodyear Tire and Rubber Co. will start design work on a 25,000- to 30,000-ton plant to make Natsyn, the company's brand of *cis*-1,4-polyisoprene. Data the engineers will use will come partly from laboratory research that goes back to 1955. The bulk of process information, however, is now being collected in a $750,000 pilot plant which has been in operation since December 1957 and is capable of producing on a tonnage basis.' A few details of the pilot plant have been referred to above.

Rapid Development

'Goodyear,' as the author remarks, 'is a late-comer to the field (*of synthetic polyisoprene R.*) compared to several others, but once under way has moved rapidly. In December 1956 Goodyear management was satisfied with soundness of laboratory work on the polyisoprene process and gave the go-ahead for a pilot plant. Just one year later the plant was in operation.'

The Next Step

Winchester's article concludes:

'So far this pilot plant has gone a long way toward the eventual goal of bridging the gap between research laboratory and full-scale commercial production. But there is still much to be learned. Just as manufacture of SBR went from a batch to a continuous process, polyisoprene no doubt will be made some day by a more continuous method. And this is the next step for the Goodyear pilot plant.'

Development of Acrylics

Two notes in *Chemistry and Industry* of March 7 1959 are, I think, noteworthy indications of the development of 'Acrylics' in the industrial field. The first of these (p. 336) relates to manufacture by I.C.I. of Acrylonitrile, at a plant which is being constructed at the General Chemicals Division at Billingham. This plant, according to *C and I*, will be the first large-scale unit of its kind in the UK, and is expected to go into production at the end of the year. Acrylonitrile 'from the new plant will be sold principally for the production of acrylic fibres,' but 'A smaller but expanding outlet is in the making of high impact-strength resins.' . . . A part of the output 'will be used within I.C.I.' in the manufacture of the 'Butakon' (butadiene/acrylonitrile) synthetic rubbers, whose properties especially as regards abrasion and high resistance to oil, heat, etc., are notable.

The second *C and I* note refers to a 'plant for Holland' (p. 339) and gives some particulars of 'A new multi-million dollar plant to manufacture "Orlon" acrylic fibre' on a '40-acre plant site at Dordrecht, Holland, by the Du Pont Company.' The capacity of the plant mentioned is to be 15 million lb. per annum. Further details are given in the *Chemistry and Industry* note.

Progress of SPR

According to the March 1959 issue of *Natural Rubber News* (Blue Section, p. 5), the Superior Processing Rubber introduced by the Rubber Research Association of Malaya to the market in 1957 is making progress. This rubber which is particularly useful, on account of processing advantages, in extrusion and calendering, and in precision work, was started off with a sale of 297 tons in 1957, and was purchased to the extent of 1,149 tons in 1958. It is

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **DR SCHIDROWITZ**

estimated that (to judge by the December 1958 figures) that sales in 1959 will exceed 2,000 tons in 1959. *NR News* mention that SPR is now available in the form of RSS, and also in Air Dried or Pale Crepe form. 'Development work on SP Brown Crepe has progressed to the point where we expect to have samples available ... by May of this year.'

Tyre Abrasion

In a paper entitled (*English translation*) 'Surface Heating by Friction and Abrasion by Thermal Decomposition,'* W. Viehmann (Gummiwerke Fulda) has investigated some interesting points in connexion with the heating and abrasion which occurs in tyres (*Rubber Chemistry and Technology*, Vol. XXXI, No. 4, pp. 925-940).

In his introduction the author says 'The question of what temperatures may arise at the boundary between pavement and tread must be answered if we are to determine the influence of these temperatures in connexion with the problem of abrasion of rubber, and if we are to determine whether abrasion is to be considered as essentially due to the tearing out of particles or to the oxidative depolymerization of the highly-heated surface layer.'

This is a paper containing much detail and matter which should be of interest to the tyre manufacturer and to physicists, but I am unable here to do more than give a few lines based on the author's summary. In this he says:

'In this research an attempt is made at determining the frictional temperatures which may occur in tyres under various driving conditions. This is based on phenomenological theories of heat conduction. Since these temperature pulses are to be traced back to heat current pulses which may last in the neighbourhood of 10^{-2} second, the resulting warming will be localized in boundary layers of the order of 10^{-2}cm.'

From the estimated values of the temperatures, the author concludes that the abrasion which occurs under normal driving conditions is purely mechanical. He then rounds off his summary by saying that it is only under extreme conditions, such as in very rapid acceleration, or in case of locked wheels ... that we may expect high frictional temperatures, which lie above the decomposition temperature of rubber.

Identifying Carbon Blacks

In the March issue of *Rubber Age* (1959, vol. 84, pp. 945 to 954) there is a paper by A. Fiorenza (Rubber Labs.; Pirelli, S.p.a., Milan, Italy) entitled 'A new method of Identifying Carbon Blacks.'

I hope later on to give a review of the chief features of this highly interesting communication, but my present remarks are to be regarded as a very brief preliminary note calling attention to it.

In a previous publication (*R. Age*, 1956, 80, 69) the author discussed a study of the identification of carbon blacks by means of the determination of 'the "colour index," that is to say the ratio between the coefficients of optical absorption for wavelengths 430 and 750nm.,' measured under certain specified conditions. In brief, in the said publication, characteristics of this, and relative methods of examination 'and its limitations, were outlined.'

Objects of New Work

In the present communication the author has given a description of a method 'designed to overcome these limitations at least partially, based on the measurement of variations due to the centrifugation of black aqueous dispersions, occurring both in the colour index as well as in the concentration of the black in the dispersions. . . .' The methods of centrifugation and of recovery strike me as looking particularly interesting.

Notes

The Fort Dunlop Suggestions Committee is featured in the February 1959 issue of *The Dunlop Gazette*, pp. 6-7. The account given points out that the *Gazette* has not the space to report fully upon all schemes, and it has, therefore, picked one or two typical ones at random. Thus, at St. Mary's Mills, Leicester, over 1,000 suggestions were received in 1954 and 1955, 'an impressive total in relation to the number of employees there.' Although today the total is fewer—368 submitted, 116 adopted and 160 receiving awards in 1957, the general standard is higher.

There are two competitions in connexion with the scheme; the Roberson Cup for the department heading the departmental suggestions league, and the Yeomans Cup for the best individual suggestion of the year. With regard to the latter the 'Yeoman's Cup winning suggestion in 1956 was perhaps the most far reaching in its effects Leicester employees have yet produced. This was Mr Harry Hobson's idea to cure the trouble of trapping of cycle cover air bag bases during the moulding operation. His suggestion to fit lugs to the mould was an essentially simple one, but cures a serious problem and is now being applied to all new plant.' The moral of this (pointed out in the *Gazette* in words and substance (believe it or not) almost exactly as this note was about to do!) was that 'It is a fair example of how the man on the job can sometimes see the problem most clearly.'

An important feature of the suggestions scheme is (referring in particular to the Hirwaun factory—in South Wales) '. . . here, as elsewhere, great importance is attached to keeping the suggestors informed as to what is being done about their ideas, and to follow up to ensure that an adopted suggestion is put into practice as rapidly as possible.' Other articles of general rather than of specific interest in the *Gazette* include 'Care of the Very Young' (in the *Safety in the Home* series).

PHILIP SCHIDROWITZ

*Translated for *Rubber Chemistry and Technology* by W. D. Wolfe, from *Kautschuk und Gummi*, Vol. 10, No. 12, pages WT 302-307, December 1957.

Questions Corner—68

(Second Series)

291. Mixed metal, organo-tin and epoxy stabilizers are used as stabilizers in polyvinyl chloride compounds. What are they?

292. What kind of additional treatments are given, as required, to cast an extruded cellulosic sheet and film?

293. One of the processes for the production of glass fibre reinforced plastics is that of dough moulding. What is this?

294. Give some data regarding the properties of polyvinyl alcohol.

(Answers next week)

Answers to Questions Corner—67

287. If some liquid monomers, together with suitable catalysts, are poured into a mould and polymerized *in situ*, useful shapes can be produced, *e.g.*, sheets, rods and tubes. Such a method has to be carefully controlled in order that the contraction associated with any polymerization, and the exothermic temperature within the mass, is not great enough to produce voids, bubbles, soft centres or undue dimensional changes.

One of the best methods known is casting in thin layers until the required bulk has been attained. This method is useful for mounting specimens in glass-clear blocks with methyl methacrylate and polyester-vinyl syrups. The first layer is partially polymerized by heat in the mould before a second layer is added, and so on. Rods may be cast from methyl methacrylate syrup by continuous stepwise polymerization in a cylindrical metal mould. Hot water is slowly raised in level over a period, giving polymerization of the syrup under pressure, from the bottom to the top of an assembly of rod moulds. Additional peroxide catalyst is added before pouring syrup into the moulds. Suitable syrups of 2-20 poises viscosity may contain 5-10% polymer.

For the production of methyl methacrylate cast sheets glass plates are used. In order to prevent bubbles, thick sheets are generally polymerized in an autoclave above atmospheric pressure. Final plunging into cold water usually facilitates separation of the glass. It is also necessary to heat treat the sheets at about 140°C., suspended in air, in order to relieve strains and remove any monomer.

288. In typical polyvinyl acetate emulsion paint consideration must be given to the following ingredients:

The resin. The polyvinyl acetate functions as a binder and gives cohesion and adhesion to the paint. Particle size is of importance and fine particles are essential for producing good gloss, freedom from sedimentation and good pigment binding properties.

Plasticizers. Plasticizers are used to impart to the resin flexibility and extensibility, and to promote film integration. A proper balance between polar and non-polar groups is necessary for maintaining compatibility without increasing the water solubility. When low solubility in hydrocarbon oils is required the phosphates are used, and they are also of value in increasing fire-resistance. The choice of plasticizer has an important influence on the affinity between certain organic pigments and the plasticized resin.

Polymerization ingredients. In the polyvinyl acetate emulsion itself there is present at least one hydrophilic colloid used to prevent coagulation during manufacture of the paint. The choice of this colloid determines the performance and characteristics of the final paint.

Colouring materials. Both organic and inorganic pigments can be used but the addition of a hydrophilic colloid may be necessary, *e.g.* methyl cellulose, but care must be taken in the choice as there may be interaction with the stabilizing system used in the emulsion which will upset the pigment dispersion itself.

289. There are a few brands of polyvinyl chloride copolymer fibres which are mainly of vinyl chloride copolymerized with vinyl acetate in varying proportions, under the trade name of 'Vinyon,' or vinyl chloride-vunyl cyanide, under the name 'Dynel.' 'Vinyon' is a copolymer of 88% vinyl chloride and 12% vinyl acetate and, as is well known, the vinyl acetate acts as an internal plasticizer, and makes possible a fibre forming polymer.

The molecular weight has a bearing on the strength of the fibres produced from these copolymers, *e.g.*, if less than 10,000 the fibres are weak and if above, say, 28,000, they are insoluble in suitable solvents for solvent spinning, which is the method used 'Vinyon' yarns have a tenacity of approximately 3.4gm./denier, with an elongation at break of 18%, and one advantage is that there is little or no reduction in tenacity when the fibres are wet. The filaments are stretched and the fibre is thermoplastic and will soften at temperatures over 70°C.

'Dynel' is a copolymer of 60% vinyl chloride and 40% vinyl cyanide (acrylonitrile). The fibres are produced by solution spinning, using acetone as the solvent, and stretched while hot and then annealed, by heat, and it is then crimped and cut to staple, or is supplied as tow which is cut into staple and crimped.

'Dynel' can be bleached and its tenacity ranges from 2.5gm./denier and elongation at break 42-30%. Moisture regain is 0.4%.

290. The main types of nitrocellulose inks that are used are: A. Silk-screen inks; B. Rotogravure inks; C. Letterpress inks.

A. Silk-screen inks are used in the form of a fairly thick paste which is applied by forcing the ink through the openings in the silk-screen stencil with a squeegee. This necessitates the use of solvents and diluents which evaporate slowly as the ink has to be worked for relatively long periods. The coating of ink is not very thick, and the ink will dry to a tack free condition on evaporation of the volatile components.

B. Rotogravure inks in contrast to the above are relatively dilute and use solvents and diluents which evaporate quite rapidly. It will be appreciated, of course, that in this printing process the inking roller revolves partly submerged in a bath of ink and excess ink which adheres to the elevations on the roll, is wiped off with a squeegee roll, and the ink is retained in the depressions of the type, which is transferred to the paper and absorbed by it as the roller continues its revolutions. The solvents and diluents must be quite volatile so that the ink will dry on the paper almost as fast as it is applied. The paper usually passes into a heated section to assist drying but, nevertheless, the speed of printing is very fast.

C. Letter-press inks, on the other hand, are transferred to the type from the inking roller but it is retained on the top of the raised type characters. The process is slower and the ink remains on the roller for long periods, at room temperature, and therefore slow evaporating solvents and diluents are used. The printed paper also passes into a heated section which evaporates the volatiles and dries the ink.

(More questions next week)

Polly Ester Says . . .

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Herbert

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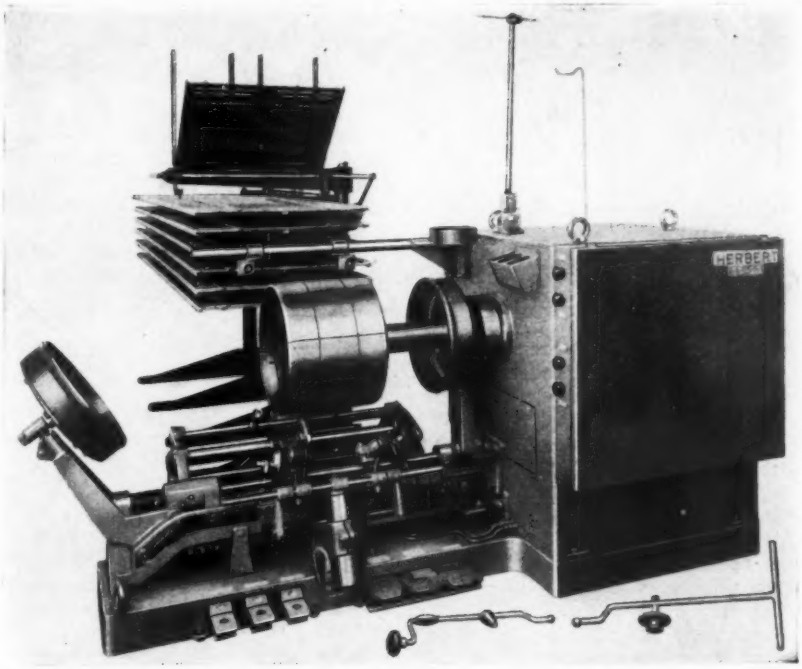

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MEN *and* MATTERS

A Review of People and Events

by George A. Greenwood

IT is not often I stray into the political sphere, and never, so far as *RJIP* is concerned, into party politics, but the House of Commons debate on the Budget on Thursday of last week was of such importance to all of us that I cannot forbear to say a word or two about it. The impulse comes not so much from a reading of the newspapers, as from remarks which have been made to me by some of my MP friends who were there, and who seem to have sensed the importance of an occasion in regard to trade between Britain and Russia.

Repeatedly has attention been drawn in these pages to the great developments by the Soviet both in rubber and in plastics. It is manifest that the vast increase in the Russian imports of rubber will require far more machinery than the country possesses, or is capable for a long time of producing, and as to plastics, it will be remembered that not long ago Mr R. E. G. Windsor went on a visit to Russia and to some of the other satellite countries which, it is understood, produced very important results for R. H. Windsor Ltd. In other respects, too, there have been interchanges of importance between West and East, both in enquiries and in sales, but the members of the respective Russian trade delegations which have been in this country during the past year or two have made it perfectly plain that transactions so far are the merest fleabite compared with what the USSR would buy if only we can preserve the peace, and she can find the money.

A three-man delegation from the Russian plastics industry visited the Ekco Works, Southend-on-Sea, on April 8, to investigate the latest developments in the British plastics field with a view to the expansion of their own industry. Mr David Radford, director and general manager of Ekco Plastics Ltd., is seen here (*right*) **showing a refrigerator component to Mr Ivan Karataev** (*left foreground*)**, vice-president of the Moscow Region Economic Council and leader of the delegation. Another delegate, Mr Nikolai Novojilov, looks on from behind, while an interpreter is in the centre**

The Trade is There

All the British trade missions to Russia have said precisely the same thing when they have come back, and now it appears from Sir David Eccles, President of the Board of Trade, that the situation for this Anglo-Russian trade is so fast developing that the financial problems involved are coming under close Government consideration. In the Commons debate, Sir David freely acknowledged the suggestions from both sides of the House that, as so many of us keep on saying, the trade is there, and the only real problem is the problem of financing it. This problem now, of course, becomes urgent because it is completely tied up with the scope of the trade mission which is being sent to Moscow under agreement between Mr Khrushchev and Mr Harold Macmillan when the Prime Minister and Mr Selwyn Lloyd were out there a few weeks ago.

Of the utmost importance in the course of this friendly Commons debate was the fact that Sir David saw no reason for contradicting the suggestion made by Mr Harold Wilson, Labour's shadow chancellor, that these orders from Russia for capital goods might well be worth anything from £150,000,000 to £200,000,000. It may be added that in these respects Mr Wilson knows his oats. He is the financial adviser, in his private capacity, to one of the great City commercial houses which does a vast trade with Russia, and he is a frequent visitor to that country.

The US Attitude

It is very disconcerting to know that a good deal of this prospective trade is being held up through the refusal of those who hold United States patents or 'know how' to permit their use and exploitation by the British firms which share them, simply because of American 'touchiness' over East-West trade—a refusal which without some protracted negotiations might hold up for a long time any sort of bargain which could be entered into between London and Moscow if we can only place bigger sterling credits at Russia's disposal.

This, of course, is largely a matter upon our side for a realistic approach by the Export Credits Guarantees Department, which, Sir David says, can and might play an important role in the new developments, but from the point of view of the British rubber and plastics, the most important point is that not only Russia, but also her satellities, are invariably and meticulously good and sound upon their commitments.

In all the circumstances, therefore, a tremendous prospect opens up for us, and it makes it even more imperative that the cold war shall be ended as quickly as possible.

The New FBI President

In accordance with forecast and expectation, Mr W. H. McFadzean was last week elected president of the

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Federation of British Industries, succeeding Sir Hugh Beaver, who has retired after holding office for two years. By a happy coincidence, the announcement appeared on the very day when it was made public that Mr McFadzean's company, British Insulated Callender's Cables, reported for the past year an increase in group net profits from £2,670,051 to £3,292,989, and that accordingly, the dividend is being raised by 1% to 13½%, with a final of 9½% against 8½%.

Mr McFadzean's appointment means certain changes in his activities for some time to come. Already, he has temporarily retired as vice-chairman and industrial leader of the Advisory Council on Middle East Trade, but he will, of course, carry out his duties at Callender's. Mr McFadzean is also a member of the Ministry of Labour Advisory Board on the Resettlement of ex-Regulars, and a member of the Council of the Institute of Directors.

To Lead the Co-Partners

Another interesting appointment is that of Sir Alexander Fleck, chairman of I.C.I., who, I am informed, has accepted an invitation to become president of the Industrial Co-Partnership Association. He succeeds that famous politician, international leader, and lawyer of earlier days, Viscount Cecil of Chelwood, who died last November when he was well over 90. Sir Alexander has for some years been closely associated with the work of the Association, and was the principal speaker at its meeting in 1954, the year which marked the inception of profit-sharing by I.C.I. He is to take part in the association's Summer Conference at St. Hugh's College, Oxford.

Sales Appointment

A familiar figure in the tyre industry and accessories trade, Mr A. W. ('Nick') Nicholson, has been appointed specialist sales representative for Southern England of Romac Industries Ltd., London. Mr Nicholson, who was formerly with Tip Top Vulcanizing Products, London, will be concerned primarily with Romac's well-known 'Cure-C-Cure' range of tyre and tube repair materials and the new Romac nylon tyre plasters.

Mr Michael Bingham

Mr Michael Bingham, a senior director of the Microcell Group, died at his home at Woodstock, Folders Lane, Burgess Hill, Sussex, on April 3. He had been in indifferent health for some time.

Mr Bingham, who was 61 years old, was particularly well known in golfing circles before he entered industry. He won many trophies in the course of his professional golfing career. He was the inventor of the plastic golf ball.

Du Pont Appointment

Wilfred P. Fletcher, well known as a rubber authority in this country and Europe, has been named manager of the new Elastomers Research Laboratory, just completed by the Du Pont Company (United Kingdom) Ltd., at Hemel Hempstead, Hertfordshire.

The laboratory, to be opened next month, will provide manufacturers of products made from neoprene and other elastomers in the United Kingdom and on the Continent with the latest advances in research, testing, and manufacturing processes. It will be staffed entirely by British graduates and technicians.

WILFRED P. FLETCHER

Mr Fletcher, an honours degree graduate of London University, was responsible for a number of new physical testing developments while associated with the British Rubber Producers Research Association from 1947 to 1958. While with the Association, he supervised its investigation work on problems relating to industrial uses of dry rubber products.

Since entering the rubber industry with the John Bull Rubber Company in 1939, Mr Fletcher has served on a number of industrial committees, including those of the British Standards Institution. He has published 20 technical papers. He has been a lecturer at the National College of Rubber Technology, at the Newton Heath Technical College, and has acted as an examiner in physics for the associateship examination of the IRI since 1955. He is a Fellow of the Institute of Physics and an Associate of the Institution of the Rubber Industry. Before assuming his new position, he spent several months in the US becoming acquainted with technical and sales service procedures at the Elastomers Laboratory of E. I. du Pont de Nemours and Company in Wilmington, Delaware.

Off to Russia

A great deal of interest has been aroused by the announcement that to the newly-created post of British Scientific Attaché to the British Embassy in Moscow has been appointed Mr David Anthony Senior, of Hampton Hill, Middlesex. His job will be to advise the British Ambassador, Sir Patrick Reilly, on scientific questions, and to report on Soviet scientific and technical developments in the civil field. Mr Senior, who will be on the staff of DSIR, has for the past nine or ten years been engaged mainly in dealing with problems of instrumentation and combustion. I am told that in his new job he will deal exclusively with problems of industry, trade and commerce.

Mr Senior, a 35-year-old Yorkshireman, had a brilliant career at that ancient foundation, Batley Grammar School, from which he won both a Robert Styring Open Scholarship to Trinity College, Cambridge, and an Ackroyd Exhibition. Mr Senior speaks Russian fluently, as well as French and German.

A Plastics Poser

Although it may be maddening for the companies involved, there is something almost humorous in the battle-royal that is now going on between two unions, the Amalgamated Society of Woodworkers and the Transport and General Workers Union as to when a plastic is not a plastic, but it is not so humorous, of course, when we realize that big orders, and the jobs of hundreds of men, tend to be involved.

Mr Leo McGree, the Liverpool district secretary of the Woodworkers, says a plastic is not a plastic when glass fibre is used, so, the society should handle the newly-devised plastic hatches and doors.

'Oh, no,' says Mr J. H. Hall, regional secretary of the Transport Workers, 'the woodworkers have no right to interfere. This work comes under *our* union. It is not a craft job.'

So the ding-dong battle goes on. The woodworkers are insisting that Transport Union men on this work must join their union, and have told their members to declare 'black' all ships in which the new product is being used.

Meantime, work for about 600 people in the Merseyside factory making the plastic hatches and doors is in jeopardy unless, that is, good sense prevails, and the opinion from Pilkington Bros. is accepted.

UNION CARBIDE APPOINTMENT

William A. Woodcock has been appointed vice-president and general sales manager, chemicals and plastics, of the Union Carbide International Co. division of Union Carbide Corporation. Mr Woodcock joined the

WILLIAM A. WOODCOCK

Union Carbide organization in 1936 as a member of the Organic Chemicals Fellowship at Mellon Institute of Industrial Research. The following year he became a technical representative for Union Carbide Chemicals Co. in New York. Before his present appointment he was a director of product marketing for the chemicals company and previous to that was sales manager, industrial chemicals, manager, new chemicals, assistant manager, new chemicals, and product manager. In his new capacity he will be responsible for international sales of chemicals and plastics.

Before becoming associated with Union Carbide, Mr Woodcock was science master for four years at the Millbrook School in Millbrook, New York. He is a member of Phi Beta Kappa, American Chemical Society, Society of the Plastics Industry, Chemical Market Research Association, and the Commercial Chemical Development Association. Mr Woodcock was born in State College, Pennsylvania. He graduated in chemistry in 1932 from Hamilton College.

New Triol

A new polyol polyether designated Niax triol LK-380 has been made commercially available by the Chemicals Department, Union Carbide International Company, Division of Union Carbide Corporation. This polypropylene glycol polyether is used in the preparation of rigid urethane foams and offers certain advantages, including improved ageing characteristics, reduced water sensitivity, and favourable economics, over formerly used polyesters.

CIBA (ARL) at Foundry Exhibition

Ciba (ARL) Ltd., are to exhibit at the Foundry Exhibition, Birmingham, in May. They will be showing a new method for vacuum forming large foundry patterns of complex shapes by a 'wet lay-up' method using 'Araldite' epoxy resin and glass-cloth. The vacuum table used has an airtight bottom forming a box into which the vacuum pipe is led. Slotted vents are placed at intervals in the top plate. A negative of the object to be made is placed on the table and, after applying a release agent, an 'Araldite' gel-coat is applied. A piece of glassfibre mat is saturated with unfilled 'Araldite' resin and placed over the gel-coat. Three or four layers of dry glass fibre mat are placed on top of this. The whole is then covered with a sheet of polyvinyl alcohol which is secured round the edges.

When a vacuum is applied, the PVA sheet is drawn down and follows the contour of the negative. The excess resin in the first layer of glassfibre mat is forced up through the dry layers. The vacuum is maintained until the resin has set. The result is an air-free compact laminate of ratio about 50:50 glass to resin.

Also on display will be a pair of 6ft. long 'Araldite' and glasscloth patterns and also a variety of patterns made by straightforward gravity casting techniques.

REVIEW

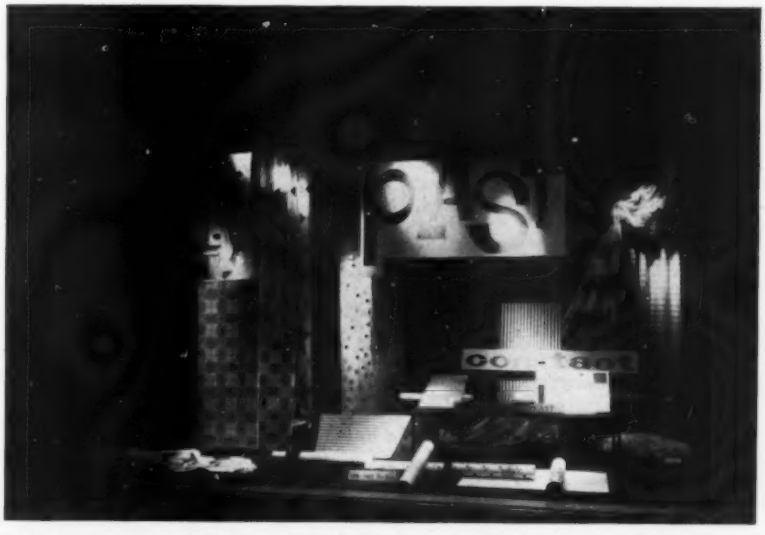
TRADER HANDBOOK 1959: A LEGAL, TECHNICAL AND BUYING GUIDE FOR THE MOTOR, MOTOR CYCLE AND CYCLE TRADES. 53rd Edition. (Published March 1959 at 17s. 6d. net (by post 19s.) by the Trader Publishing Co. Ltd. Size 8¼in. x 5¾in. 716 pages.)

The *Trader Handbook* 1959 provides essential information for manufacturers, trade suppliers and repairers of motor, motor cycle and cycle goods. Its practical and comprehensive treatment of every aspect of these industries supplies accurate and useful answers to the daily problems of buying, selling and servicing throughout the year.

There are seven sections, divided by guide cards with thumb indexes for easy reference. Preceding the sections is a legal guide covering the motor, motor cycle and cycle industries with information on points of law which experience has shown to be most troublesome to traders.

Under Transport Service Equipment is an up-to-date list of firms who specialize in the manufacture or sole distribution of garage and workshop equipment for manufacturers and repairers. Manufacturers and sole distributors of motor, motor cycle and cycle accessories and components are listed in the Buyers' Guide, while approximately 5,000 proprietary names attached to such goods are identified in a separate section.

∴ Copies may be ordered through the Books Department, RUBBER JOURNAL AND INTERNATIONAL PLASTICS, Maclaren House, 131 Great Suffolk Street, London, S.E.1.



Well-arranged and lighted, this display of Storey's plastic curtaining and sheeting in a Norwegian store (Sundt and Co.) is typical of many in that country, where greater prominence is given to such window displays than is the case in this country. Storey's export very considerable quantities of curtaining and Con-Tact to Norway

Indian Rubber Industry

NR PRODUCTION INCREASED

PRODUCTION of natural rubber in India has increased by about 60% in the past 10 years, statistics released in New Delhi show. Production of natural in 1958 totalled 24,348 tons. Output in 1948 was 15,422 tons. Consumption of natural in 1958 totalled 34,755 tons against 19,719 tons in 1948. Domestic production was augmented by imports of natural and synthetic to meet the country's requirements. About 11,878 tons of natural and 3,523 tons of synthetic were imported during 1958. About 120 rubber products are being manufactured in the country and India is now practically self-sufficient in most rubber products.

The total area under rubber at the end of September 1958 was about 272,575 acres. Over 6,100 new planting licences, covering an area of about 50,947 acres, were issued during the first nine months of 1958 as well as 340 replanting licences covering an area of about 3,190 acres. A scheme has been sanctioned for replanting 70,000 acres of old low yielding rubber lands with high yielding strains spread over a period of ten years. The scheme provides for the payment of a subsidy to the planters on a slab basis ranging from 250 to 400 rupees per acre. It started operating from 1957 and about 6,500 acres have already been replanted during these two years. In 1958, about 2,500,000 high yielding rubber seeds were distributed to 3,314 growers.

SR Plant

To cover the gap between production and consumption quickly there is a proposal to set up a synthetic rubber plant at an estimated cost of 150 million rupees with a capacity of 20,000 tons a year. A team of experts from a leading United States firm visited India recently in connexion with the setting up of the plant and undertook investigations. The team's report is expected shortly.

Pirelli Resilient Webbing

Independent suspension for driver and passengers is provided in the bench front seat of the new Morris Oxford, Series V, as a result of a new development in the use of Pirelli resilient webbing. In previous designs the webbing has been laid either along or across the frames of the seat and squab in separate strands. In the new Oxford, the webbing is arranged in hammock fashion, using a principle familiar in two of the most comfortable forms of seat—the hammock and the deck chair. The resilient webbing is attached to the top frame of the squab, passes through a sliding slip at the junction of squab and seat, and is then attached to the front rail of the seat itself.

Lt-Colonel C. W. S. Gardner has been appointed chairman of the Ulu Yam Rubber Co.

ASTM FLUID AGEING METHODS

A recently completed testing programme has shown that the ASTM fluid ageing methods (D 471) can be used satisfactorily at test temperatures up to and including 300°F. The work was conducted by a task group headed by A. C. Simon of the H. O. Canfield Co., Clifton Forge, Virginia, and composed of representatives from fluid ageing sub-committee of the SAE-ASTM Technical Committee on Automotive Rubber working with Sub-Committee 19 of ASTM Committee D-11 on Rubber and Rubber-like Materials.

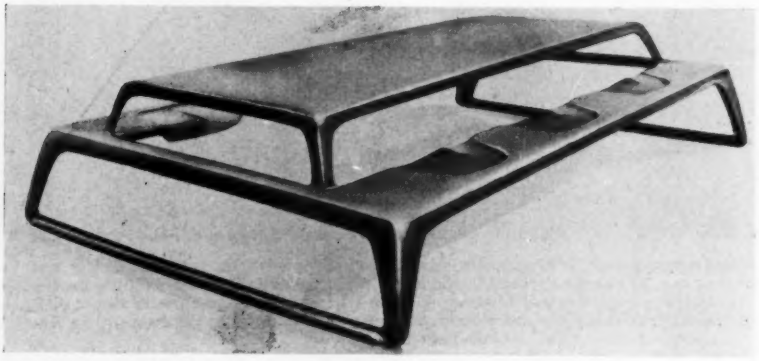
Increasing temperature requirements in both the automotive and aircraft industries necessitated confirmation of present methods as standard test temperatures rise above the previous norm of 212 or 250°F. A careful analysis of such variables as elastomeric composition, heating method, contamination, and testing techniques failed to show inadequacies in the test method when evaluated on a round-robin basis among five laboratories. The stability of the test medium, however, should be suspected when divergent results are obtained.

Further work is contemplated to ascertain the suitability of D 471 at temperatures in excess of 300°F. as the trend toward extreme thermal exposure of elastomeric products continues.

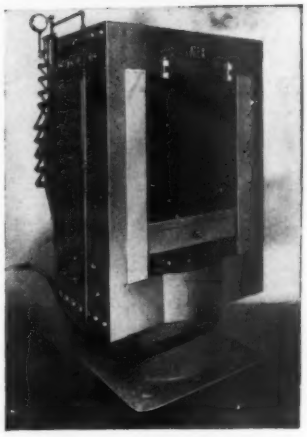
Mr E. J. C. Edwards has been appointed chairman of the Bukit Cloh Rubber Co., the Bahru Selangor Rubber Co., the Pilmoor Rubber Co., the Teluk Piah Rubber Estate (1914) and the Rosevale Rubber Co.

USES OF PLASTICS

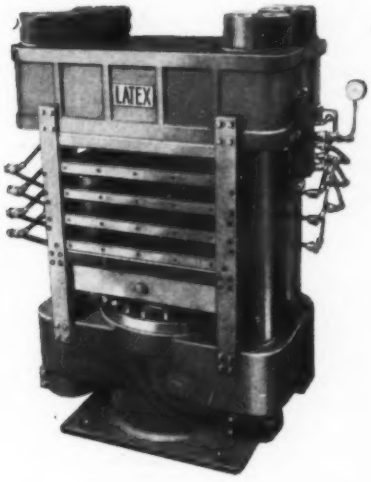
A runner-up in the 1958 Horners Award Competition was the children's 'Unitable,' *below*, designed by Mr. R. P. Hickman, of the Lotus Engineering Co. Ltd., Tottenham Lane, London, N.8. It is a one-piece moulding of glass fibre reinforced plastics. The fuel hod, *right*, now being marketed by G. and E. Equipment and Contracts Ltd., New Milton, Hampshire, is made from Rigidex high-density polythene supplied by British Resin Products Ltd. Unlike conventional metal hods, it effectively resists the corrosive elements in solid fuels



Latex Engineering Co



4-Column Press
1000 tons



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Typing Elastomers

NEW ASTM-SAE SYSTEM

THE new ASTM–SAE (American Society for Testing Materials and Society of Automotive Engineers), system for typing and classing elastomer compounds is as follows: All elastomer types will be determined by hot air ageing tests. All basic classes will reflect volume of swell in oil. With the new format which is being developed by the SAE–ASTM Technical Committee on Automotive Rubber, elastomer types will be based on the following maximum allowable changes: Tensile strength plus or minus 30%. Elongation minus 40%. Shore hardness plus or minus 15%.

Swell tests for determination of elastomer classes will require the use of ASTM oil No. 3 at 302°F. The values for volume increase shall be: Natural rubber, SBR and butyl rubber—no specification. Neoprene—plus 35 to plus 75%. Hypalon—plus 76 to plus 150%. Nitrile rubber—plus 16 to plus 35%. Polysulfide rubber —plus 7 to plus 15%. Polyacrylates —plus 16 to plus 35%. Silicones—plus 35 to plus 75%. Viton—0 to plus 6%.

Formerly, elastomer types were specified as follows: Type R—Compounds made from natural rubber, reclaimed rubber, synthetic rubber, or rubber-like materials, alone or in combination, for services where specific resistance to the action of petroleum base fiulds is not required. Type S—Compounds made from synthetic rubber or rubber-like materials for services where specific resistance to the action of petroleum base fluids is required. Type T—Compounds made from synthetic rubber or rubber-like materials for services where specific resistance to the effects of prolonged exposure to abnormal temperatures or compounded petroleum oils, or both, is required. The former class system indicated resistance to low aniline points oils, oils at high or low temperatures, or dry heat.

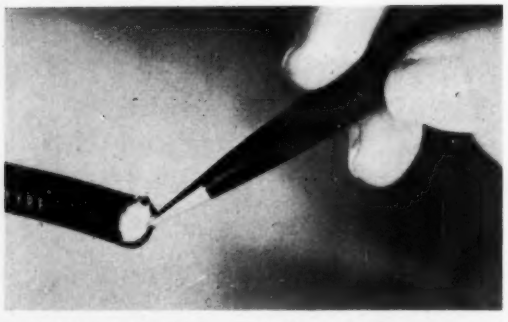
North Group in South America

Geoffrey White and Henry Rothenberg, managing directors of the North Group of Companies, manufacturers of PVC gloves and clothing for industrial and domestic use, have just returned from an extensive trip through South America, visiting Venezuela, Brazil, Uruguay and the Argentine.

During their stay in Rio, a partnership was effected with Messrs Indacol of Rio de Janeiro, the prominent Brazilian industrial glove manufacturer, and the newly-formed company of James North do Brasil SA will be the largest manufacturer of safety equipment in South America with Mr Eduardo Frias of Rio as its president.

CIBA Fellowships

Among the six Fellowships awarded by the CIBA Fellowship Trust for the academic year 1959/60 are the following: Mr G. L. Duncan (Aberdeen University) to study at Louvain University (Polymer chemistry); Mr K. Jones (Sheffield University) to study at Heidelberg University (Organic chemistry).



To meet the specific requirements of community television systems in the US, radio frequency coaxial cables are being manufactured which embody a specially compounded foam insulation made of Union Carbide polythene and jacketed with black polythene. The foamed core is made up of millions of polythene bubbles, filled with an inert gas, each of which is completely sealed from the other. This foamed cable core provides much lower attenuation for a given cable size. The non-contaminating cable jacket of polythene provides chemical resistance, superior weathering and excellent abrasion properties, all of which contribute to extended cable life

P. W. LITCHFIELD

The death has occurred, in Phoenix, Arizona, of Mr Paul W. Litchfield, honorary chairman of the board of directors of the world-wide Goodyear organization. He was 83. A 'grand old man' of the world's rubber industry, and a well-known international figure, Mr Litchfield had been associated with Goodyear for nearly 59 years. It was in July 1900 that he first joined the company, then an infant concern.

P. W. LITCHFIELD

Mr Litchfield played a leading role in the company's expansion, starting as superintendent of all production, development and engineering. He became a member of the board in 1906, and nine years later was appointed vice-president. He was elected president of the company in 1926 and made board chairman and re-elected president in 1930. In 1940 he was named board chairman and chief executive officer. In April 1956 he handed over his responsibilities as chief executive to Mr E. J. Thomas, president of the company, and took the title of honorary chairman of the board in October 1958, when Mr Thomas became chairman.

Danish Rubber Imports

Danish imports of crude rubber during January totalled 627 tons against 479 tons during December, the Department of Statistics reports. Malaya supplied 333 tons, Nigeria 62 tons, Indonesia 94 and Belgian Congo 50 tons. Other sources included the US 25 tons, South Vietnam 26 tons and Britain 17 tons. January imports of synthetic rubber were 103 tons against 148 tons and included 80 tons from the US, 11 from Canada, and 10 tons from Britain.

Mr R. J. Shawyer has been appointed a director of Polypenco Ltd. He continues as sales manager.

Rubber Statistics

WORLD POSITION AT END OF JANUARY

THE latest Press release issued by the Secretariat of the International Rubber Study Group sets out the world rubber position at the end of January last. The following preliminary figures, which are expressed in long tons, compare the position at the end of January 1959 with that obtaining at the end of January 1958.

NATURAL RUBBER

	Jan. 1959	Jan. 1958	Year 1958 (Revised)
Production:	167.5	147.5	1,855.0
Consumption:	192.5	152.5	1,985.0
			Change since
Stocks at January 31:			Jan. 1 1959
In producing areas ..			287.5 – 5.0
In consuming areas ..			222.5 + 5.0
Afloat			212.5 – 10.0
			722.5 – 10.0

Synthetic Rubber

The synthetic rubber position during January as compared with the position a year earlier, is set out in the following table:

SYNTHETIC RUBBER

	Jan. 1959	Jan. 1958	Year 1958 (Revised)
Production:	122.5	115.5	1,210.0
Consumption:	122.5	100.0	1,227.5
			Change since
Stocks at January 31 ..			Jan. 1 1959
			257.5 + 2.5

United States General Position

The US Department of Commerce has issued the following statistics for the month of January. The figures are expressed in long tons:

NATURAL RUBBER

Consumption:
49,913 tons of which latex 7,184 tons
Stocks:
82,487 tons of which latex 10,025 tons

SYNTHETIC RUBBER

	Production	Consumption	Stocks
S-type ..	90,261	74,222	147,243
Butyl ..	4,992	5,359	16,827
Neoprene ..	9,991	7,198	15,638
N-Type ..	3,260	2,857	7,335
	108,504	89,636	187,043

Total new rubber consumption during January amounted to 139,549 tons, a higher level than had been achieved for at least two years, though 136,972 tons had been consumed during the previous October. Natural rubber accounted for 35.77% of this amount, as compared with 36.78% during 1958 as a whole.

Vietnam

During 1958 Vietnam's exports are estimated to have reached 67,651 tons of rubber, or some 5,000 tons less than the total for the previous year. The bulk of these exports, 54,797 tons, went to France, while the US took 7,260 tons, the UK 2,225 tons and Western Germany 1,791 tons. Other destinations for this rubber included Singapore (678 tons), Mexico (326 tons) and Japan (181 tons). Smoked sheet accounted for 47,676 tons, sole crepe for 1,110 tons, and other crepe and cuttings for 18,149 tons.

Sole Crepe Exports

Exports of sole crepe from Malaya during January totalled 641 tons, having been almost twice as great a year previously when, in January 1958 they totalled 1,140 tons. This decline doubtless reflects the falling market for this product which has been experienced in recent months. The UK took 333 tons of the January total, while France took 52 tons and Spain 56 tons; Hongkong also took 56 tons.

In the case of Ceylon, sole crepe exports totalled 59 tons in January as against 97 tons a year earlier.

British Industrial Plastics

Mr C. H. Glassey has been appointed chairman of British Industrial Plastics and has resigned as managing director. Mr E. R. Crammond has relinquished the chairmanship but remains a director, advising the company on financial matters.

Mr J. E. Beard and Dr W. Blakey, executive directors for a number of years, have been appointed joint managing directors. Mr S. Gibbs and Mr F. E. Miles have been appointed executive directors to fill existing vacancies on the Board. They have been employed within the group for over 20 years.

It is understood that in view of the extension of the group's interests, an extraordinary general meeting is shortly to be called to increase the maximum permitted number of directors, at present nine, by two.

Cabot Carbon Changes

D. D. Cochrane, vice president of Godfrey L. Cabot Inc., Boston Massachusetts, in charge of foreign operations, announces the appointment of Mr John Andrews, former managing director of Cabot Carbon Ltd., to the position of assistant director of foreign operations. As Mr Cochrane's assistant he will be stationed in Boston, Mass. He will move from Southern France where he has served since September 1955 as president and director general of Cabot France SA. The appointment is effective from August 1.

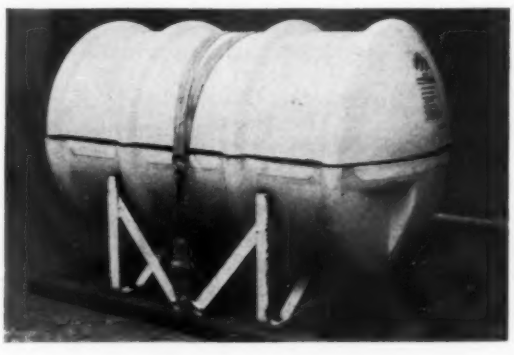
D. E. O'Mulloy, formerly works manager of Cabot Carbon Ltd., Ellesmere Port, has been elected president and director general of Cabot France SA by the directors of the parent company. Mr O'Mulloy has been on temporary assignment, first with Cabot France SA and secondly with Australian Carbon Black Pty. Ltd. since October of 1957. He will return to France about June 1 1959 and will take over his new duties on August 1.

William Charles Beech, formerly production superintendent, Cabot Carbon Ltd. has been appointed by Mr Cochrane to the temporary position of interim works manager of Australian Carbon Black Pty. Ltd.

Dechema Annual Meeting

A feature of the annual meeting of the Deutsche Gesellschaft für chemisches Apparatewesen e.V. (Dechema), May 21 and 22 1959 in the Palmengarten, Frankfurt am Main, will be the presentation of the Dechema Prizes for 1957 and 1958 of the Max-Buchner Research Foundation. A series of lectures reporting the progress which has been made in technical chemistry and chemical engineering in recent years will be given.

The programme may be obtained from the Dechema, Frankfurt (Main) 7, Postfach.



Polyester resins reinforced with glass fibre chopped strand mat are being used by Microcell Ltd., Camberley, Surrey, in the manufacture of containers for 25- and 20-man liferafts made by Elliott Equipment Ltd. An interesting feature of these containers is that they will withstand the impact of striking water from a height of 70ft.

PATENT SPECIFICATIONS

The following information is prepared from published Patent Specifications. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 3s. 6d. per copy (including postage).

Microcellular Soles for Footwear

No. 807,305. C. and J. Clark Ltd. Inventor: C. E. Webb. Application, June 18 1955. Filed, September 14 1956. Published, January 14 1959.

A shoe soling material comprises an assembly of microcellular rubber layers alternating with layers of a substantially non-extensible material and partially enclosed by a covering of rubber or rubber resin composition, the whole assembly being vulcanized to form one body to serve as an independent soling material or vulcanized during application to a shoe upper. The term 'substantially non-extensible material' signifies a material which is substantially less extensible than the associated microcellular rubber. Such material may be vulcanized natural or synthetic rubber, perforated metallic sheet, light open-weave calico or a woven material such as viscose rayon fabric.

The process overcomes the difficulty hitherto experienced in making unitary soles and heels of microcellular rubber of accurate dimensions, as previously the variation in thickness of these units has resulted in uneven expansion. The process is particularly applicable to the manufacture of shaped soles or sole and heel units, but it may be applied also to the manufacture of microcellular shoe soling material in sheet form.

Preparation of PVC

No. 807,634. N. V. de Bataafsche Petroleum Maatschappij. Application and Filed, January 15 1957. Application in Netherlands, January 17 1956. Published, January 21 1959. Addition to No. 784,283.

According to Specification No. 784,283, PVC is prepared by polymerizing vinyl chloride in emulsion by means of hydrogen peroxide as the catalyst, the emulsifier being a monocarboxylic acid salt containing 8 to 22 carbon atoms in the molecule. According to the present invention, PVC having improved electrical properties is obtained by treating the PVC prepared as above with a water-ionizable metal compound which will convert the emulsifier into a water-insoluble compound.

Extrudable Polythene Compositions

No. 807,664. Union Carbide Corporation. Application and Filed, January 10 1957. Application in USA, January 23 1956. Published, January 21 1959.

The incorporation of carbon black into polythene improves the resistance of the polythene to degradation by sunlight, but such compositions of polythene and carbon black commonly display erratic extrusion characteristics. This has been traced to the presence of moisture in the compositions, the moisture being absorbed by the carbon black. This difficulty is overcome according to the invention by using a carbon black having a mean volume-surface diameter of 32 to 44 millimicrons. Such a carbon black has a reduced affinity to absorb moisture compared with finer blacks, and polythene containing carbon black within this specified range of volume-surface diameter has consistently good extrusion characteristics.

Polyolefins

AT THE PLASTICS EXHIBITION

A PAPER on the 'Mechanical and Physical Properties of Polypropylene' will be given at the International Plastics Exhibition convention by J. M. Goppel, Koninklijke/Shell-Laboratorium, Amsterdam, Holland. In this paper, various types of polypropylenes are classified according to crystallinity and molecular weight.

Various physical and mechanical properties of polymers thus defined by two characteristics are given, particular attention being paid to tensile data, modulus and impact resistance. It is shown that for further characterization a third quality, *viz.*, molecular weight distribution, should be taken into account.

In connexion with molecular weight and molecular weight distribution, viscosity measurements on the molten polymer are reported, which can be directly related to the ease of processibility of the material. This quality also follows from injection moulding diagrams, which are compared with those obtained on polythenes. After dealing with various other properties of polypropylene such as resistance against solvents and chemicals, stress cracking, abrasion resistance, and electrical properties, two rather important problems are considered, *viz.*, low-temperature brittleness and oxidation and ageing resistance.

It is shown that brittleness at low temperatures can to some extent be improved and that, provided suitable anti-oxidants are selected, excellent oxidation stability can be obtained.

Moulding Characteristics

'The Moulding Characteristics of Polypropylene' will be discussed in a paper by G. Campbell, Plastics Division, Imperial Chemicals Industries Ltd., Welwyn Garden City, Herts. Polypropylene offers to the moulder new and very interesting properties, especially heat resistance, rigidity and apparently complete freedom from environmental stress cracking.

The molecular structure of polypropylene differs from that of polythene and a different approach is required in selection of moulding conditions. Rigidity equal to that of high-density polythenes is obtained at very much lower crystallinity. The flow of molten polypropylene is appreciably stiffer, or more viscous, than that of polythene but is influenced to a greater degree by changes in temperature and pressure in the moulding machine. High tensile modulus at elevated temperatures permits short cooling periods in the mould. Mould shrinkage is less than that of polythenes and as a result of the relatively small difference between lengthwise and transverse shrinkages, warpage problems are much reduced.

These, and other characteristics of polypropylene, are discussed in relation to the choice of conditions for obtaining optimum properties in moulded articles.

WRMA AGM

The nineteenth annual meeting of the Waste Rubber Merchants Association of Great Britain, was held at the Great Eastern Hotel, Liverpool Street, London, E.C.2, on Wednesday March 18. In the course of his annual report, the retiring president of the association, Mr R. H. Birks, said that merchants had become resigned to the fixed low prices offered by home consumers on the one hand and the lack of general interest by overseas buyers on the other. 'I seriously consider, therefore, that until we, as active merchants in the trade, can find some method to improve our business, whether by sales promotion schemes or by closer unity in our aims for better prices, the future outlook will not be too bright.'

Amongst officers elected for the ensuing year were: president, Major C. A. Solomon; vice-president, Mr L. W. Bottomley; hon. treasurer, Mr L. Lipton.

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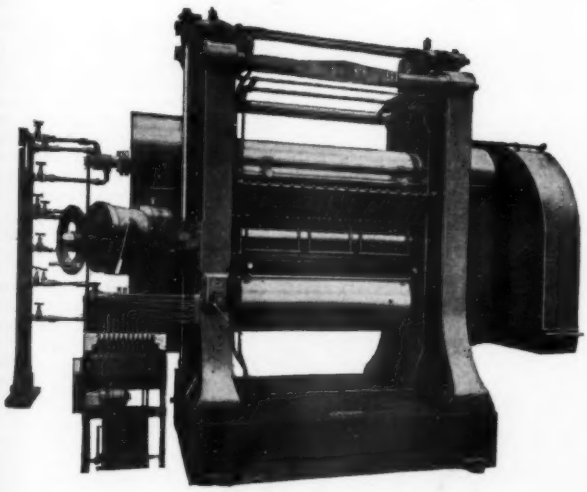


24" dia. x 68" face 3-ROLL EVEN and FRICTION SPEED RUBBER CALENDER, with Patent Nip Feed Guard, Circular Lubricating System from individually driven 12-point Forced Feed Lubricator with Self Filling Pumps. Mechanically Operated Elevating Unit for top and bottom Rolls. Variable Speed Drive to suit any requirement.

Plantation Share Survey

THROUGHOUT the past month there has been a stream of buying orders for rubber shares. This buying has by no means been of a specialist nature and, furthermore it has not been concentrated on the leading shares, although they have benefited most in the main price upswing.

Even a conservative estimate of the buying pressure would put it down as the best the market has seen for a number of years. There are many reasons for the sudden surge of interest, but it is probably true to say that the 'boom' (it has already been tagged with that label by the popular Press) finds its foundation in the vast improvement in the statistical position of the commodity.

There can be little doubt that many people are buying rubber shares today who have never before been into this section of the market place, and they are probably unaware of the underlying statistical position, strong though it is, and are buying purely on the rise in the price of the commodity on the London market.

Rubber is currently changing at very near the 28d. per lb. mark, which compares with the average price for 1958 of 23¼d. per lb. and is a peak for the year. It is obvious that there is a substantial potential profit difference between the two prices and it is this aspect which is encouraging investors. Whether they will prove right in all cases is very much another matter. It is not generally appreciated among the investing fraternity that many rubber company boards are apt to sell forward a large part of their estimated crops, so that the benefit in these cases will prove more apparent than real.

Looking into the longer term future, however, and there are many in the City who are at last prepared to do this with regard to rubber shares, the position seems a good deal brighter than it has for many years.

The last announcement from the Rubber Study Group was to the effect that consumption in January had reached the rather high level of 192,500 tons. This compared with a production estimate for the same month of 167,500 tons—a considerable shortfall particularly in view of the fact that rubber is such a marginal commodity. The position a year ago was entirely the reverse; production came out at 152,500 and consumption was put at 147,500 tons.

There can be no doubt that this very satisfactory position is almost entirely due to the large buying on behalf of the Iron Curtain group (if one is broad-minded enough to include China in this category).

Russia for her part has taken something like 20,000 tons off the market in one month and China has bought some 18,000 tons. From the standpoint of the producers the position is being further helped by the incidence of American buying. For some time now it has been obvious that the American stock position was far from healthy and that any upswing in the production indices would inevitably lead to large American orders. The upswing in production has taken place.

A further point is coming more and more into discussion—the ability of natural to compete with synthetic, regardless of price differential. It would seem that many of the leading rubber growers are of the view that there is an expanding and not contracting market for raw rubber. They say that the consumption differential which at present favours the synthetic variety by two to one will be preserved and that as the overall consumption of rubber, regardless of type, must rise, the outlook, long term or short term, for natural remains exceptionally bright.

To anyone experienced in the world of rubber these are not new facts or theories, it is in reality the repetition of statistics and views that has often arisen in the past. But it is worth pointing out that in the past they have not been supported in stock markets to the extent that they are now—and by good hard investment cash.

In the past month some of the gains in the leading rubber shares have been staggering. The leader, UNITED SUA BETONG has shot up no less than 10s. to a new post-war peak of 82s. and even at this level the yield on them is in the region of 12½%. Buyers of these shares are clearly taking the view that the board will maintain the dividend at 50% despite the falling off in profits which is almost certain to take place when the full results for the past year are examined. The optimists obviously feel that the board will be sufficiently encouraged by the present position to dip into the huge reserves and meet part of the dividend payment.

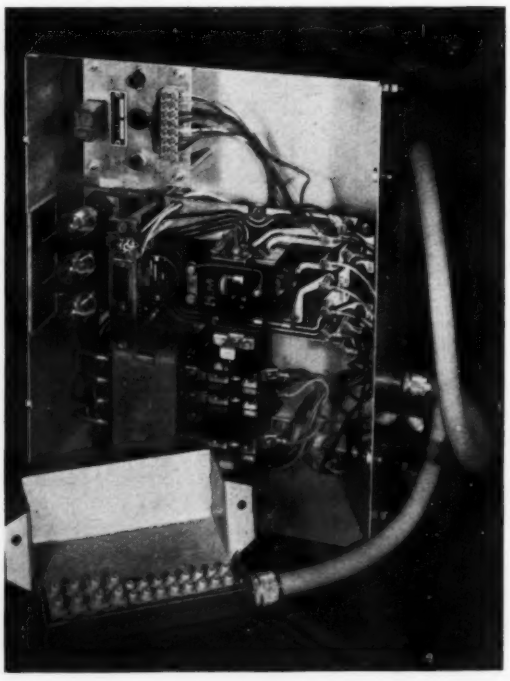
BUKIT RAJAH ordinary shares have followed 'Suas' very closely, spurting by around 9s. since our last column to 45s. HIGHLANDS AND LOWLANDS have also made substantial headway.

A fact that has not received widespread comment in the national Press, but is deserving of attention, is that this group is within one step of becoming the world's biggest producer of natural rubber, a title long held by 'Suas.'

Highlands is currently offering to acquire all the ordinary shares of the SCOTTISH MALAYAN concern. The deal is put forward mainly on the basis of an exchange of shares. The full plan is that every 20 Scottish Malayan shares should be exchanged for 17 Highlands plus 8s. 4d. in cash. In terms of market prices the deal looks quite favourable to Scottish Malayan shareholders and there is apparently no reason why it should not be accepted. If it goes through then there is a new king in the rubber-growing world.

Sir John Hay, chairman of LINGGI PLANTATIONS, has recently stated that he considers a price war between synthetic and natural rubber as being unlikely. Sir John outlined the strength of the producer of natural. He said

Continued on page 603



Bakelite copper-clad laminated, which incorporates foil only 0.0015 in. thick, is being used in the manufacture of printed circuits for oil-fired boiler control units made by Urquharts (1926) Ltd., Greenford, Middx. The technique of printed circuits is normally associated with micro currents, but up to three amps, necessary in this application, can be carried by the Bakelite circuit

Rubber Markets

LONDON

A further widespread and appreciable advance has been recorded in the London rubber market during the past week. The tone of the market has been very firm indeed and gains extend to over a ½d. per lb. with the Spot ⅝d. up at 27¾d. per lb. The Budget had a favourable effect on the tone, as it did on most other commodity markets, while a fairly good demand developed. In addition there were unconfirmed reports of further Russian buying in the East.

Latest prices are as follows:
No. 1 RSS Spot: 27⅝d.-27¾d.

Settlement House:
May 27⅝d.-27¾d.
June 27¾d.-27⅞d.
July/September 28d.-28⅛d.
October/December 28d.-28⅛d.
January/March 28d.-28⅛d.

No. 1 RSS cif basis ports:
May 27⅝d.-27⅞d.
June 27⅝d.-27⅞d.

Godown:
May 93¼ Straits cents nominal.

Latex

Centrifuged latex per gallon in drums, April/May shipment, 16s. 4d. seller, cif European ports. Spot, seller, 16s. 6d. Bulk, seller, 16s. 3d. Creamed, seller, 15s. 10d. Normal, seller, 12s. 4d.

AMSTERDAM

The Amsterdam rubber market ruled as under on April 13:

	Guilders per kilo	
No. 1 RMA	April 13	Previous
April	2.65	2.65
May	2.65	2.65
June	2.65	2.65
April/June	2.69½	2.66
July	2.66½	2.66½
August	2.66½	2.66½
September	2.66½	2.66½
July/September ..	2.72½	2.67½
October	2.71	2.67

Sales: Nil Tendency: Firm

DJAKARTA

There was fair interest for sheet one ready and nearby deliveries on April 13. Sheet one ready delivery was traded at 24.10. Turnover was small and the market ruled steady quiet. Export certificates were quoted at 332 paid/buyer.

	Rupiahs per kilo	
	April 13	Previous
Spot No. 1 Priok ..	24.00b	23.75b
Spot No. 2 Priok ..	23.40b	23.25b
Spot No. 3 Priok ..	22.60b	22.25b
No. 1 fine pale crepe ..	23.00b	23.30b

Tendency: Steady, quiet

BANGKOK

Market closed on April 13.

NEW YORK

The New York rubber market ruled as under on April 13:

Dealers' Prices

US cents per lb., ex-dock

	April 13	Previous
No. 1 RSS, April	33⅛b-34a	33⅛b-33⅜a
May	33⅜b-34a	33⅛b-33⅜a
No. 2 RSS, April	33⅛b-33⅜a	32⅜b-32⅝a
May	33⅛b-33⅜a	32⅜b-32⅝a
No. 3 RSS, April	33 b-33⅛a	32⅛b-32⅜a
May	33 b-33⅛a	32⅛b-32⅜a
No. 1 RSS Spot	33⅜b-34 a	33⅛b-33⅜a
No. 3 Amber blanket crepe, June	31⅜n	31⅛b-31⅜a
No. 1 latex, thin crepe, April ..	32⅜n	32⅜n
No. 1 latex, thick crepe, April ..	33n	32⅜n

Futures—Rex Contract

	Close	Prev. Close
May ..	34.50b-34.75a	34.00b-34.25a
July ..	33.90b-34.00a	33.60b-33.75a
Sept. ..	33.55t	33.10b-33.20a
Nov. ..	33.50t	33.10b-33.15a
Jan. ..	33.40b-33.50a	33.05b-33.15a
March..	33.30b-33.45a	33.05-33.08t
May ..	33.20b-33.40a	33.00b-33.10a

Sales: 65 Tendency: Very steady

Rubber futures were sharply higher on April 13 in moderate dealings. The Rex contract showed gains ranging to around a cent a lb. Purchases of rubber were based on reports of increased Russian buying of crude in the Far East. One well-informed trade source also said that manufacturers were light on stock. Physical rubber was higher, but business was light.

Crepe Rubber

The following prices ruled in New York on April 8:

Dealers' selling prices:	Cents per lb.
Sole crepe, standard grade 'A'	46 (46)
Thick crepe	34¼ (34)

Synthetic Rubber

The following prices ruled in New York on April 8:

	Cents per lb.	
	April 8	Previous
GR-S, fas New Orleans	23.25	23.25
Neoprene GN, fob Louisville	41	41
Neoprene W, fob Louisville	39	39
Butyl, fas New Orleans	23	23
Paracril, fob Baten Rouge	50	50

SINGAPORE

The market opened higher on favourable overseas advices on April 13 and, after minor fluctuations, a steadier tendency was noted towards the end of the morning sessions. There was rather better interest for April as the period for dealing neared its end. Lower grade interest was on the small side with factories small buyers. The afternoon was steady almost throughout with only short periods in which some small profit-taking took place. Lower grade interest was better than in the morning but, with supplies of nearby difficult to come by, exchanges were small. The market finished on a steady note at the highest for the day with Number One April buyers 1¼ cents above Friday's final level at 94⅜ cents per lb.

Straits cents per lb., fob Malayan ports to open ports

	Close	Previous Close
No. 1 RSS April ..	94⅜—95	93 —93⅜
May ..	94⅞—95	93½—93⅝
No. 2 RSS April ..	93⅜—94¼	92½—93
No. 3 RSS April ..	92⅜—93½	91⅜—92½
No. 4 RSS April ..	91⅜—92½	90½—91
No. 5 RSS April ..	90⅜—91½	89½—90
No. 1 RSS Spot ..	94⅜—95	92⅞—93⅜
No. 3 blanket, thick remilled April ..	89 —91	87½—89½
No. 1 fine pale crepe, April	98 —99	96 —97
2X thin brown crepe, April ..	91½—92½	89 —90

Tendency: Steady

The Industrial Syndicate quote latex, native produce, 60% centrifugal, packed in rec. drums fob at 182.00d. per gallon.

CEYLON

No. 1 RSS

The price for No. 1 RSS, spot, at Colombo on April 13 was 121 (closed) Ceylon cents per lb.

PLANTATION SHARE SURVEY

Continued from page 602

that as the larger newly-planted areas come into production then costs will decline, in addition the growers have considerable adaptability. Sir John was not in favour of a price-fixing scheme for the industry, and it would be fair to add here that he is not the only rubber chairman who holds this view, although he is certainly the one with the widest audience.

Labu Cheviot rubber announced a profit of £316,000 which compared with £367,000 a year ago. The net figure after taxation came out at £190,000, a fall of some £30,000. The dividend, however, is lifted slightly to 40%. Labu shares were not dulled by the news and are currently standing at a new peak of 6s. 3d.

Seafield rubber has now declared its first interim of 10%. From Pilmoor rubber comes news of a capital repayment of 6d. per share from the sale of part of the company's property. This will reduce the 2s. shares to 1s. 6d. but proposals will be put before shareholders to consolidate the new shares into units of 2s. Sittang Valley rubber is paying 10% on receipt of profits from Burmah. This is half the payment made a year ago.

Mr C. M. Medlicott, of the Dunlop Rubber Co. Ltd., has been elected to the Council of the British Cycle and Motor Cycle Industries Association.

Industry INTELLIGENCE

Technical Data

Nonox ZA

Nonox ZA is an antiozonant having the chemical composition 4-isophopylamino diphenylamine. It provides outstanding protection against ozone in natural rubber, SBR and certain other synthetic rubbers, while in addition, it possesses marked antioxidant properties of the kind associated with the best types of anti-flexcracking antioxidants. An evaluation of Nonox ZA in natural rubber and SBR is reported in a recent booklet issued by the Dyestuff Division of I.C.I. The compounds used contained 40 to 50 phr of 'Kosmos' 60, an HAF black. Excellent protection is provided by 1.5 phr of Nonox ZA under conditions of dynamic exposure in both natural rubber and SBR, while under conditions of static exposure at a strain level of 15 to 20%, the amount of Nonox ZA required is 1.5 to 3.0 phr in SBR and 3 to 4 phr in natural rubber. The work included tests on actual tyres with SBR sidewalls, illustrations being given of sidewalls both with and without Nonox ZA after running 23 days at 32 mph (approx. 18,000 miles). Nonox ZA is relatively non-blooming in comparison with other members of this class of antiozoants, but in common with the latter, it possesses staining properties.

Hakuenka Activated Calcium Carbonate

Hakuenka is an activated calcium carbonate of Japanese manufacture, and is produced in two grades, CC and DD. Brief reference was made to this material in 'Industry Intelligence' in our January 31 issue, and additional information is available in a 56-page report distributed by Croxton and Garry Ltd., 16-18 High Street, Kingston-upon-Thames, Surrey, sole UK representatives for this material.

The report is divided into two parts, dealing with Hakuenka in natural rubber compounds and in reclaim compounds respectively. In the first part of the report, both Hakuenka CC and DD were used in proportions of 50, 100 and 150 phr (equivalent to 19, 38 and 57 volumes), and were also compared with other pigments in loadings of 19 and 38 volumes. For the work described in the second part of the report, two base mixes were used, one containing 70 parts of natural rubber and 60 parts of reclaim and the other 50 parts of natural rubber and 100 parts of reclaim. Hakuenka CC was compared with other pigments in proportions of 19 and 38 volumes in both these base mixes. Extensive tables and graphs are given for a range of physical properties of the vulcanized compounds, including data showing the effect of Geer oven ageing on the tensile strength, modulus and elongation at break. The properties of the compounds containing Hakuenka were superior to those of the compounds containing the other pigments.

Electron micrographs are reproduced of Hakuenka, fine precipitated calcium carbonate and basic magnesium corbonate, as well as these pigments dispersed in vulcanized rubber. The electron micrographs show the smaller particle size of Hakuenka compared with the other pigments examined and also demonstrate the good dispersion which can be achieved with Hakuenka in rubber.

Machines, Materials and Equipment

Dunlop Duraband Tyres

The Duraband RB1 tyre by Dunlop, which until now has only been available to rally drivers (it was particularly successful in last year's Alpine Rally) has now been released for general sale. It has a braced tread and very flexible casing, which combine to resist distortion, particularly during fast cornering where the tyre drifts less and wears

The Dunlop Duraband braced tread

more slowly than conventional tyres. The Duraband is designed primarily for sports cars, but will also appeal to some owners of saloon cars who experience motoring conditions likely to cause rapid tread wear. It should be realized however, Dunlop state, that braced tread tyres have certain limitations. Steering at low speeds tends to be heavy, and the ride is noticeably harder below about 40 mph. There is also the possibility of abrupt breakaway at high cornering speeds when the limit of road/tyre adhesion is reached.

Trolley Loading Ovens

A new comprehensive range of 'B-W' gas-fired forced convection trolley loading industrial ovens with a choice of direct or indirect heating and incorporating the latest safety features recommended by the Gas Council and HM Factory Department, has been introduced by Barlow-Whitney Ltd. of London and Bletchley. They are primarily intended for the larger and heavier type of charge which can be more conveniently handled on mobile platforms or stillages. They can also be supplied with suspension bars, or racks for tray loading or other special arrangements to requirements and are suitable for many process heating applications, including curing, polymerizing and stoving.

Publications Received

Spectrosol Solvents

Spectrosol solvents manufactured by Hopkin and Williams Ltd. have been introduced in response to very numerous requests for materials that are specially suitable for use as solvents in absorption spectroscopy. The rapidly increasing use of quartz spectrophotometers in all types of industrial and research laboratories has created a correspondingly increased demand for solvents of adequate ultra-violet transparency. Many solvents, says the company's booklet on the subject, have been used for ultra-violet analyses and, ultimately, it is hoped to include a good proportion in the Spectrosol range.

Union Carbide Plastics

Trays, specially designed for use in airliners, are being produced by the Union Carbide International Co., US. Openings to accommodate various sizes of glasses, condiments, and dinner and dessert plates are moulded into one surface. Other products of the company including: A cocktail shaker moulded from UC C-11 acrylonitrile-styrene plastic; a cake tray and cover moulded from polythene; and refrigerator containers, are described in 'Plastics Review,' Vol. 7, No. 4.

'Nonex' Non-Ionic Surface Active Agents

A book with the above title has been issued by the Chemicals Division of Union Carbide Ltd. It describes a group of surface agents based on the esterification of ethylene and propylene glycols and polythene glycols. They are marketed under the trade mark 'Nonex' and are being increasingly used in industry. These agents are non-ionic in character and have a wide range of physical properties which make them suitable for use in wetting, dispersing and emulsifying applications and as plasticizers. In plastics manufacture 'Nonex' agent 26 acts as an anti-static agent when incorporated into PVC compositions, effectively diminishing dust pick-up. 'Nonex' agents are also being used extensively in a number of other industries including food (to retard the staling of bread) and ceramics (as soluble binders for clays, etc.).

Future Events

April 18—*April* 30

INSTITUTION OF THE RUBBER INDUSTRY

Tuesday April 28. Meeting of the Council of the Institution at 2.15 p.m.

Midland Section.—Thursday April 30 at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 6.45 p.m. Annual general meeting.

Scottish Section.—Tuesday April 28 at the Institution of Engineers and Shipbuilders in Scotland, 39 Elmbank Crescent, Glasgow, C.2, at 7.30 p.m. Annual general meeting to be followed by a talk and film entitled 'Rubber in Building,' by F. E. Jones, F.R.I.B.A.

PLASTICS INSTITUTE

Midlands Section.—Monday April 27 at the Queen's Hotel, Birmingham. Annual luncheon. Tuesday April 28, visit to the Central Fire Station.

Sheffield Group, Royal Statistical Society.—Thursday April 30 at the Cavendish Room, Grand Hotel, Sheffield, at 7 p.m. Annual general meeting, followed by 'A General Simulation Programme,' by Dr K. D. Tocher, United Steel Companies Ltd.

South Wales and Monmouthshire Section.—Wednesday April 22. Works visit to Semtex Ltd., Brynmawr.

EXHIBITIONS

Corrosion Exhibition, Royal Horticultural Hall, London, April 27-30.

Engineering, Marine, Welding and Nuclear Energy Exhibition, Olympia, London, April 16-30.

Chemical Institute of Canada.—Friday May 1 at Sheraton-Brock Hotel, Niagara Falls, Ontario, Rubber Chemistry Subject Division meeting. October 19-21 at the Guild Inn, Toronto, Ontario, 9th Canadian High Polymer Forum, co-sponsored by the National Research Council and the Chemical Institute of Canada.

Export Opportunities

Hose Piping and Fittings for Canada

Mr D. E. ff. Jemmett, president of Northern Canada Supply Ltd., 275 Bloor Street West, Oshawa, Ontario, has advised the UK Trade Commissioner at Toronto that he would be interested in hearing from United Kingdom manufacturers of hydraulic hose, nylon hose, polyethylene hose and PVC hose, and fittings for these various types of hose. The Canadian company is considered to be a suitable connexion for United Kingdom firms.

Manufacturers interested in this enquiry should write direct to Mr D. E. ff. Jemmett and notify the UK Trade Commissioner, 119 Adelaide Street West, Toronto, that they have done so. B.o.T. reference ESB/7842/59.

The address of the Export Services Branch of the Board of Trade is Lacon House, Theobalds Road, London, W.C.1. Telephone number: Chancery 4411, extensions 776 or 866.

COMPANIES in the NEWS

British Xylonite

British Xylonite Ltd. is raising the final dividend from 10% to 12% to make 15% for 1958, against 13%. Sir Laurence Merriam, the chairman, states that group profits are down slightly from £1,090,557 to £1,023,877 but after a reduced tax charge of £543,000 (£613,000), the net balance is a little higher at £480,877, against £477,557.

Polymer Corporation Ltd.

The annual report for 1958 of Polymer Corporation Ltd., Sarnia, Canada, was issued on April 9. In his statement, Mr E. R. Rowzee, president and managing director, said that despite intensified competition in world rubber markets the 1958 volume of sales edged slightly upward.

Adverse factors including price reduction put into effect last August and increasing costs for materials, labour and services combined to reduce earnings below those of the previous year. After providing $6,068,000 for income tax, net earnings amounted to $6,377,000, representing $3.19 per share. Dividend payments totalled $4,000,000 or $2.00 per share.

Polymer's export business, accounting for about two-thirds of the output of the plant, continues to be an important factor in the company's operations as well as in the Canadian economy. The increasing pressure of competition, particularly as it concerns these vital export markets, is significant in the future outlook of the company. The starting up of synthetic rubber plants in the United Kingdom, Germany and Italy during 1958 has added to the world supply while the general overcapacity existing in the United States synthetic rubber industry has focused more interest in that country on the export markets of the world.

In the face of these challenges, Polymer reports a continuing strong demand for its products and anticipates a broadening acceptance of goods produced from synthetic rubber. To keep pace with the situation Polymer has made certain changes in its Marketing and Research and Development Divisions to broaden the services available to its customers, to improve the quality of its products, and to accelerate the development of new products.

During 1958 a new specialty latex plant, designed primarily for the production of foam rubber latex was completed and put into operation. An addition to the research and development laboratories gave increased impetus to the expanding programme of product development. A start was made on construction of off-site warehouse facilities, designed to speed delivery of customers' orders and to enable more efficient production scheduling. Plans were also completed for a new pilot plant and construction is actively under way. Completion of this unit will provide for expansion of the programme of new synthetic rubbers which the company has been vigorously pursuing for some time. Improvements to employee facilities, which have been proceeding on a scheduled plan over the past years were also continued throughout the plant.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

CONFLO (782,457) For plasticizers and wetting agents, all being chemical products for addition to cement and concrete to render them easier for working. By Joseph Freeman Sons and Co. Ltd., Cementone Works, 96 Garratt Lane, Wandsworth, London, S.W.18. (Class 1; March 18 1959).

BASILBLAK (783,191) For blacks, being pigments. By the Ship Carbon Co. of Great Britain Ltd., Paycocke Road, Basildon, Essex, and Chadwell Works, Grove Road, Chadwell Heath, Essex. To be associated with No. 779,733 (4194, 1206). (Class 2; March 18 1959).

TIMELITE (778,169) For plastics included in Class 17 in the form of sheets, rods, tubes and of shaped sections, all for use in the manufacture of watch and clock crystals. By Peterlite Products Ltd., Chesterfield House, 26/28 Fenchurch Street, London, E.C.3. (Class 17; March 18 1959.)

STYROTHERM (783,696) For thermally insulating materials made of expanded polystyrene. By Unilock Partitions Ltd., Rutherford Way, Crawley, Sussex. (Class 17; March 18 1959).

CORRO-MAT (783,826) For plastics in the form of sheets, rods, blocks and tubes, and articles made therefrom, all being goods included in Class 17. By Smith and Nephew Plastics Ltd., Neptune Street, Hull. (Class 17; March 18 1959).

DOWEX (779,106) For synthetic resins for use in manufacture and for use in the treatment of water. By the Dow Chemical Co., Midland, Michigan, USA. Address for service is c/o Stevens, Langner, Parry and Rollinson, 5 to 9 Quality Court, Chancery Lane, London, W.C.2. To be associated with No. 732,395 (4059, 260) and others. (Class 1; March 25 1959.)

PLASMETIC (784,070) For plain and galvanized steel strip coated or laminated with plastics, the steel predominating. By Metalon Steels Ltd., Jubilee Works, Short Heath, Willenhall, Staffordshire. (Class 2; March 25 1959.)

PATENT LIST

Printed copies of the Specifications in the following list can be obtained from the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d., including postage, but about six weeks after the date of this publication will usually elapse before they come available. Orders with remittance may be sent in advance to the Patent Office, and will be fulfilled immediately the Specifications are published.

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection on April 8 1959

Farbenfabriken Bayer A.G. Process for the production of high molecular weight thermoplastic polycarbonates. Addition to 808,486. 811,628.

J. R. Geigy A.G. Process for the production of heterocyclic carboxylic acids of the pyrazolidine series as well as the esters and salts thereof. 811,700.

Farbenfabriken Bayer A.G. Mixing apparatus and process for producing polyurethane plastics. 811,695,

Dow Chemical Co. Stabilized compositions comprised of copolymers of styrene and acrylonitrile and method for their preparation. 811,683.

Dow Chemical Co. Phenolic synthetic resin drying oils. 811,568.

Dow Chemical Co. Method for the preparation of improved resinous aromatic polyetheralcohols and products thereby obtained. 811,569.

Ferro Chemical Corporation. Plastic compositions. 811,532.

Siemens-Schuckertwerke A.G. Silicon-containing compounds and synthetic resins produced therefrom. 811,687.

H. G. C. Fairweather (General Aniline and Film Corporation). Monoazo dyes of the anthraquinone-azo-naphthalene series and their use in the coloration of synthetic polymeric materials. 811,524.

E. I. du Pont de Nemours and Co. Production of fibre-reinforced plastic sheet materials. 811,637.

Courtaulds Ltd. Polyacrylonitrile solutions. 811,638.

E. I. du Pont de Nemours and Co. Curable polymers. 811,725.

Farbwerke Hoechst Vorm. Aktiengesellschaft Meister Lucius, and Brüning. Process for producing fast dyeings on shaped structures of aromatic polyesters. 811,723.

H. Alexander and L. S. S. Merrony. Welding of sheet thermoplastic synthetic resinous materials. 811,580.

Pittsburg Plate Glass Co. Transparent thermoplastic synthetic organic polymeric sheeting. 811,721.

T. Engel. Method of, and apparatus for, the pulverization of thermoplastic materials. 811,423.

Farbenfabriken Bayer A.G. Process for the polymerization of ethylene. 811,633.

Dunlop Rubber Co. Ltd. Apparatus for continuously coating a cord wire or the like with rubber or other thermoplastic material. 811,436.

Imperial Chemical Industries, Ltd. Treatment of hides and skins with resin dispersions. 811,694.

NEW COMPANIES

Bryanston Mouldings Ltd (621,456). —February 20. Capital: £100 in £1 shares. To carry on the business of manufacturers, testers and sellers of and wholesale and retail dealers and mail order dealers in plastic tools and plastic articles, electronic and electrical instruments, components and equipment, etc. The directors are: Albert Saunders, 41 Clanricarde Gardens, London, W.2, director of Saco Electronics Ltd.; Cyril E. C. Cooke, 1 Lincolns Court, London Road, Enfield, director of Saco Electronics Ltd.; Frank K. Hughes, 30 Slough Lane, Kingsbury, London, N.W.9. Regd. office: 24 Bryanston Street, London, W.1.

Kay Brothers Plastics Ltd. (621,497). —February 20. Capital: £1,000 in £1 shares. To acquire from Kay Brothers Ltd., the business of plastics manufacturers carried on by them at Marple as 'Kay Brothers Plastics,' etc. The directors are: Alfred L. Sinclair, Bradford House Farm, Nether Alderley, Cheshire; Donald L. Dixon, 3 Hill Top Drive, Marple, Cheshire; Derek B. Smith and John H. G. Webb. Regd. office: Reddish, Stockport.

Reclaimed Tyres Ltd. (622,525).—March 6. Capital: £100 in £1 shares. Regd. office: Kings Road, Reading.

Rubber Journal and International Plastics CLASSIFIED ADVERTISEMENTS

ARTICLES FOR SALE (SECONDHAND)

6d. a word, Minimum 12/6 Box 2/-

EXTRUSION cylinder, 175 mm (7in.), for rubber, with screw and bearings but without drive and motor. Almost new. Attractive price.—Reply to "Gumaelius," Postfack 12 79, Jonkoping, Sweden. (367)

FOR immediate disposal 2 modern first-class condition horizontal spreading machines, each 18ft. long capacity 64in. and 72in. Each with self-contained electric drives.—Box 376. (376)

TWO rubber spreading machines, excellent working condition, 60in. Robinson and 72in. Bridge.—Box 360. (360)

COMPRESSOR SETS

400 c.f.m. BROWETT LINDLEY 120 p.s.i. with LAURENCE SCOTT 95 h.p. slipring motor, 400/3/50.
TWO—330 c.f.m. BROOM AND WADE 100 p.s.i. with BROOK 75 h.p. slipring motor, 400/3/50.
230 c.f.m. INGERSOLL RAND 100 p.s.i. with L.D.C. 60 h.p. slipring motor, 400/3/50.
156 c.f.m. INGERSOLL RAND 100 p.s.i. with BROOK 40 h.p. slipring motor, 400/3/50.
Many others in stock would welcome your enquiries, capacities between 5/2,400 c.f.m. at 100 p.s.i.

GEORGE COHEN SONS & CO., LTD.,
WOOD LANE, LONDON W.12.
Tel.: Shepherds Bush 2070 and
Stanningley, Nr. Leeds, Tel.: Pudsey 2241. (385)

ARTICLES FOR SALE (SECONDHAND) (continued)

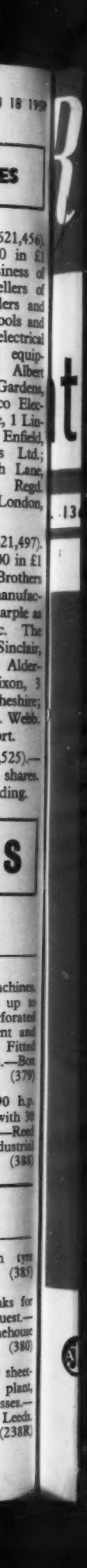
TWO Tomlinson continuous band hot air drying machines. Complete 4 'Turblex' heating batteries, pressure up to 200 p.s.i. steam drying chambers 42ft. long fitted perforated S.S. band, 36in. effective width. All electrical equipment and full instrumentation. Specially designed easy cleaning. Fitted wet wash automatic cleaning device. Excellent condition.—Box 379. (379)

60IN. x 24in. 4-bowl even friction calender with 90 h.p. variable speed drive. 4½in. Iddon strainer extruder with 30 h.p. drive. 4 Carter high speed braiding machines.—Reed Brothers (Engineering) Ltd., Replant Works, Woolwich Industrial Estate, London, S.E.18. Telephone: Woolwich 7611/6. (382)

MISCELLANEOUS

6d. a word, Minimum 12/6 Box 2/-

AVAILABLE regular supplies 205/305/405 mesh tyre crumb.—Box 385. (385)

'COTSWOLD' dipping machines and circulating tanks for latex and PVC. New catalogues now available on request.—Lionel Hook and Sons, Ebley, Stroud, Glos. Tel.: Stonehouse 614/5. (380)

MANUFACTURERS of roughing machines for rubber sheeting, sponge rubber, splitting machines, leather cloth plant, embossing plates and rollers, spreading machines and presses.—G. L. Murphy, Ltd., Imperial Works, Menston, Nr. Leeds. (238R)